ELECTRICAL REVIEW

Vol. CXLVI 27th JANUARY 1950 No. 3766

Managing Editor: HUGH S. POCOCK, M.I.E.E. *Technical Editor:* W. O. FENWICK, M.I.E.E.
Industrial Editor: J. H. COSENS *Technical Consultant:* C. O. BRETTELLE, M.I.E.E.

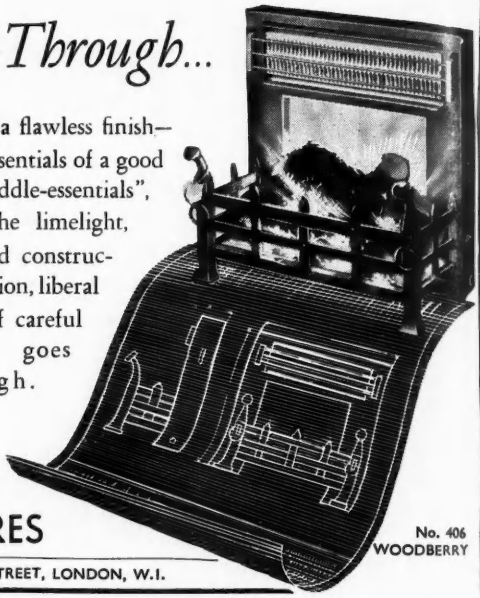
IN THIS ISSUE

B.E.A. Research	139
North Wales Power. *By A. R. Cooper, M.I.E.E., M.Inst.F.*	141
New Generating Plant	145
Views on the News	146
Area Boards' Reports	147
European Power	150
New Books	151
Protection of Small Motors. *By A. R. Blanchard*	152
Recent Introductions	155
The Year's Progress	157
Correspondence	161
Faraday Lecture	162
Personal and Social	163
Overseas Electrical Trade	166
Prismatic Glassware	175
Domestic Appliance Factory	179
Next Week's Events	180
Classified Advertisements	75
Index to Advertisers	92B

EDITORIAL, ADVERTISING & PUBLISHING OFFICES: Dorset House, Stamford St., London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No.: Waterloo 3333 (60 lines). Annual Subscription: Home and Overseas £3 6s. 0d.; U.S.A. and Canada $11.00. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, and crossed "Lloyds Bank." Entered as Second Class Matter at the New York, U.S.A., Post Office.

Through-and-Through...

Attractive design and a flawless finish—these are the first and last essentials of a good electric fire. But the "middle-essentials", so often elbowed from the limelight, are no less important; sound construction, internal surface protection, liberal insulation, and a quality of careful workmanship which goes through-and-through.



No. 406
WOODBERRY

Berry's Electric Ltd

MAGICOAL FIRES

TOUCHBUTTON HOUSE, NEWMAN STREET, LONDON, W.1.

6718

CAMBRIDGE DECADE BRIDGES

No. of Dials or Sections.	Resistance Values (ohms).	Range of Resistance Measurable (ohms).	Accuracy per cent.
4 dials	1 to 11,110	0·01 to 10^7	0·1
8 ratio coils			

This portable Bridge can be supplied either with self-contained galvanometer, as illustrated, or for external galvanometer connection.

Details of this and other BRIDGES AND RESISTANCES are given in **LIST 165-X.**

CAMBRIDGE INSTRUMENT COMPANY LIMITED

13 GROSVENOR PLACE LONDON S.W.1

WORKS : LONDON & CAMBRIDGE

ELECTRICAL REVIEW

Vol. CXLVI No. 3766 27TH JANUARY, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

B.E.A. Research

SUPPLEMENTATION OF EXISTING FACILITIES

NO apology is required for returning so soon to the first report of the British Electricity Authority, especially as it enables some aspects of the industry to be viewed for the first time against the country as a whole.

This report is a good one and there should not be any difficulty in following the sequence of events dealt with for each of the eleven chapters is reasonably self-contained and each paragraph is numbered for convenience of reference.

Authority's Policy

Chapter 6 explains, in five pages out of 321, how the research which the B.E.A. "must conduct" is being organized. It is evident that special attention has been paid to the planning of this work. It is being so co-ordinated that the bulk of it may continue to be done by specialized and existing organizations, rather than by the creation of new bodies which would overlap.

Thus the B.E.A. is continuing jointly to finance the E.R.A. (whose twenty-ninth annual report is due next month); it is availing itself of the services of the N.P.L. (which is 50 years old this month) particularly in relation to continuity of supply; it is exchanging information with individual manufacturers and hopes to use the specialized facilities possessed by B.E.A.M.A. members for developing circuit control in preference to incurring further major capital expenditure on large-scale experimental plant.

Direct investigation by the Central Authority is under the immediate direction of the Research Sub-Department of the chief engineer. The programme calls for considerable expansion of the resources taken over from former undertakings. The small laboratory established by the former C.E.B. at Leatherhead is also being extended to deal with problems which can best be attended to by the Authority's own staff. Appendix 30 lists 28 items in this category already being investigated and 18 future studies.

System Operation

Transmission staffs of the generating divisions, who will make their own field investigations, are chiefly concerned with the discriminative protection of their systems and will give high priority to instrumentation for the recording and analysis of fault phenomena.

The Area Boards have various research facilities, mainly in the metering domain, but they will also need to study the parallel operation of networks on a much wider scale than has been customary in the past.

The principal thermal and chemical laboratories are the generating stations themselves. There, similarly, basic electrical machine defects, stability problems and power regulation can be concentrated upon. Certain of the power stations will, in part, serve as large-scale laboratories. For instance, the two 15 MW gas turbo-alternators "in course of installation"

in the Manchester and Newcastle-upon-Tyne areas respectively will initially burn fuel oil, but they have been designed to permit the experimental use of gas produced from coal later on. At the same time the range of the steam cycle is likely to be increased by the further elevation of pressure and temperature.

Meanwhile the technicality which most urgently confronts the B.E.A. is that of making more effective use of the fuel available to it. Hence, as the deputy chief engineer (research) has pointed out elsewhere, all power stations are in practice testing establishments which will sub-let their detailed problems to the most appropriate laboratories, for it is true (in the absolute sense) that the overall efficiency is low. Yet it is equally true that 21.5 per cent (1949) has been surpassed only in the United States where, incidentally, 31 per cent has very recently been claimed for the first set in a new station on a site chosen with extreme care.

NEW GENERATING PLANT

The breaking of records seems to have become a hobby of the B.E.A. In addition to generating and selling more electricity during its first year of operation than in any other comparable period, it is now announced that more generating plant was put in operation during 1949 than in any previous year. Considering the way in which the installation programme has been, and is being, limited by so many circumstances outside the control of the Central Authority, the figures tabulated on another page show that last year's achievement is no mean one—but plant installed does not necessarily mean a corresponding increase of available capacity, particularly of boilers.

E.T.U. AND PROFITS

Drastic treatment of companies' surpluses is advocated by Mr. W. C. Stevens, general secretary of the Electrical Trades Union. He considers that his proposals to put a limit on the amount of free reserves and confiscate any amounts exceeding this limit would have a number of beneficial effects. These are held to include stopping the use of resources for unnecessary or wasteful capital development and superfluous "stockpiling" in secondary industries. Decisions upon these highly technical and commercial problems, which require expert knowledge of the particular industries concerned, would be made by a "National Profits Arbitration Tribunal" of four persons. As these people could not possibly arrive at their decisions without guidance they would have to employ quite a considerable staff, although Mr. Stevens thinks that the Inland Revenue could handle the business. Apart from that, public hearings of cases by the Tribunal would provide it with a more than full-time job. There are three or four hundred thousand concerns on the Register of Companies. Even if the plan were a meritorious one (which is very questionable) it is impracticable.

EXPORTS IN 1949

Although exports of electrical apparatus and machinery in 1949 attained the record figure of £122,339,128—£18,546,396 more than in 1948—there was a tendency during the last quarter for trade to decline from the exceptionally high totals of the earlier part of the year. This is contrary to the trend of export trade generally. The results of the next few months will show whether this is only a temporary set-back to the unprecedented advance since the war or whether more serious features are involved.

THE UNIT OF HEAT

Following acceptance by the International Conference on Weights and Measures of a recommendation by the International Unions of Physics and Chemistry, the fundamental unit of heat is to be the joule, which is the unit of energy in the practical system while the erg is the unit of energy in the c.g.s. system; thus the joule is equal to 10^7 ergs. It is now announced that the use of the joule with convenient multiples thereof, for example the kilojoule (kJ) and megajoule (MJ), is acceptable to the Institution of Electrical Engineers, which has expressed the hope that the Royal Society may take steps to secure agreement on the relevant conversion factors, so that all thermodynamic quantities may be expressed in joules. Some hospital works are, incidentally, using the joule as the unit of "dosage" in certain of the newer forms of electro-medical treatment.

North Wales Power

Reasons for Proposed Hydro-Electric Developments

By A. R. COOPER*, M.I.E.E., M.Inst.F.

THERE has been much controversy, both public and private, about the tentative proposals for further hydro-electric developments in North Wales which are at present contemplated by the British Electricity Authority. What are the reasons for considering these proposals and what form are these developments, if adopted, likely to take? It should be understood that, although preliminary schemes have been drafted by Messrs. Freeman, Fox & Partners and Mr. James Williamson, the consulting engineers [*Electrical Review*, 20th August and 31st December, 1948], final schemes will not be put up for consideration by the Authority until surveys at present in progress, and likely to occupy most of another year, have been completed.

The plant/load position in North Wales at the present time is roughly that the maximum demand is some 90 MW

* Divisional Controller, Merseyside and North Wales Division, British Electricity Authority.

Aerial view of the existing Maentwrog 24,000 kW power station site (indicated by the white arrow) on the Afon Dwyryd estuary with the Trawsfynydd artificial reservoir in background

Present Dolgarrog 17,700 kW development site looking south-west, with Lakes Cowlyd, Eigiau and Coedty seen in the background and the River Conway in foreground

and the rate of consumption is some 400 million kWh/annum. Of this total about 85 million kWh is generated by existing hydro-stations in North Wales and the remainder is imported from steam stations 60-90 miles away on Merseyside, or in the Midlands. Therefore, North Wales is importing more than three-quarters of its total electricity requirements and, if the load grows as it is expected to, additional plant will have to be installed to meet the increasing demand.

It becomes a matter for consideration whether this additional load shall be met by steam plant in the Midlands or elsewhere, with transmission lines 80 to 100 miles long, or whether it shall be met by developing some of the natural water power resources which exist in the mountains of North Wales. In comparing the two methods of meeting this additional load, the economic merits of the various schemes have naturally to be examined and will probably have a significant bearing on the result, but other factors have also to be considered.

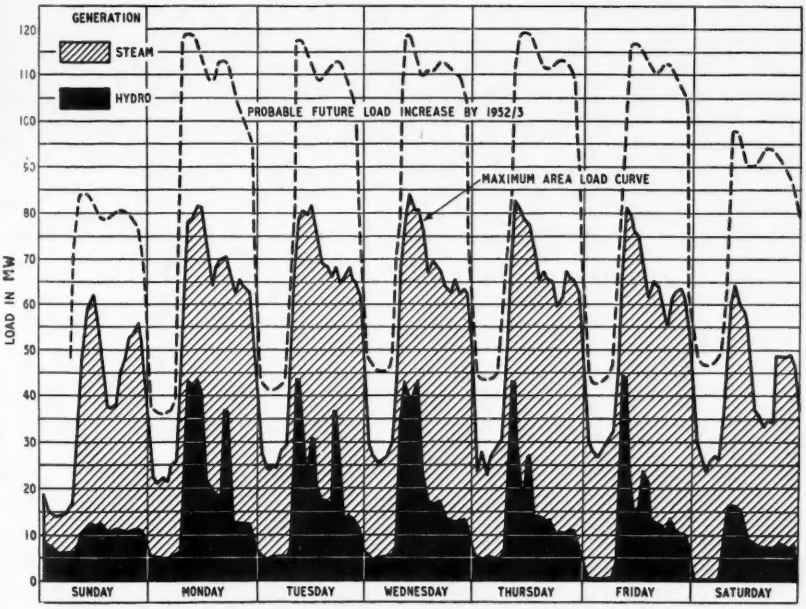
There is, for example, the problem of finding suitable sites for steam power stations while the amounts of raw materials, such as steel and copper, needed would be much greater with steam plant plus transmission than with local hydro-generation. The saving of fuel which would be possible with the provisionally proposed schemes in commission would amount to some 400,000 tons annually. This is not very significant when measured against the annual output of the British coal mines, but it would be a saving which would

continue in perpetuity and, moreover, a hydro-station, unlike a steam station, does not draw on a diminishing asset for its motive power.

In this connection it should be appreciated that the fuel requirements of steam stations in this country are likely to be increased by some 10 million tons a year over the next five years. So far as amenities are concerned, other things being equal, the hydro-electric station wins every time. There are no chimneys or cooling towers, no coal supply or ash disposal problems and no sidings with shunting of railway traffic. One further point which should be appreciated is that the distribution schemes which have been prepared by the Merseyside and North Wales Electricity Board will be less costly and are likely to be put in hand much earlier if they can be fed from comparatively low voltage sources of power within the area, than if they have to be supplied from extensions to the 132 kV grid system.

If an examination of the economic merits of steam versus water power indicates that the hydro-electric proposals will be cheaper, the only objection which can be raised against them will come from those individuals who consider that these schemes will destroy the beauty of the countryside. It is probably inappropriate in an article of this nature to discuss the question of amenities, but nobody seems to be quite clear what the word means. The advocates of electricity supply consider that electricity is one of the greatest amenities of our civilization. The opponents hold the view that amenities are something less tangible than, say, electric cookers and consist of such sights and sounds as are provided by nature unadorned, or perhaps I should, in fairness, say, by nature unaffected by the works of man.

There is no end to the discussions which can emerge from these themes, but the hard fact remains that, if the use of electricity is to be developed in North Wales, the hand of man will have to intrude more and more, either in the



Typical weekly load variations in North Wales section of Merseyside and N.W. Division, March, 1949

shape of hydro-electric proposals or as grid lines coming from various parts of the country. Reference has been made by many critics to the use of gas turbines (which use oil from the Far East) and to steam power stations (without suggesting suitable sites) and to the "early adoption" of atomic power (without realizing that, so far as it has been developed, atomic energy would merely provide an extremely expensive substitute for coal).

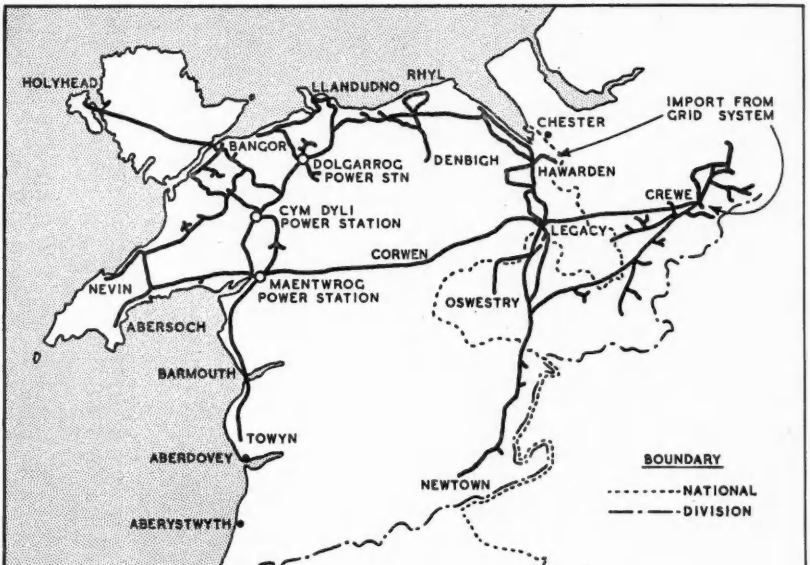
For all practical purposes, however, we may take it that the increasing loads in North Wales will have to be met either by steam power stations with their associated transmission lines, by local hydro-electric generation, or by a combination of both. Hydro-stations are exceptionally well suited to peak load working and, when operating in parallel with the national grid, they would be designed to deal with the higher portion of the load duration curves. The kWh available would probably be associated with the maximum number of kW which could be regarded as reasonably firm.

In the curve of daily load variations in North Wales for a typical seven days (see page 143) the black portion represents the outputs which have been obtained from existing hydro-electric schemes in North Wales, the balance being imported at Crewe and Hawarden from the national power grid. The dotted portion shows how the demand is expected to increase over the next three years.

Approximately the whole of this increase could have been met by the proposed hydro-electric developments. The technical aspects of these new proposals will be dealt with in a succeeding article, but it may be appropriate to describe at this point the three principal hydro-electric stations which already exist in North Wales.

Early this century a plant was laid down at Cwm Dyli on the eastern slopes of the main Snowdon Range where rain intensities are among the heaviest in the British Isles with recorded annual falls of over 190in. This plant, of some 5,000 kW capacity, operating at over 1,000ft

Principal transmission lines in North Wales showing points of imports from national grid



head, was probably among the first in this country to be laid down for a general public supply by water power and it is still in everyday use. Its annual output is of the order of 10 million kWh, which amounts to roughly 6 million kWh/sq mile of water-gathering area.

On the Carnedd Range, farther to the north, dominated by Carnedd Llewellyn (3,484ft) the run-off from the eastern slopes of the range, draining into the River Conway, was first made use of about 1907 for the generation of electric power for the production of aluminium at Dolgarrog, where supplies of the necessary bauxite and other raw materials were brought to the works up the River Conway. This plant operated originally at 1,000ft head. The station, as now adapted for public supply, operates at two distinct gross pressure heads of 1,170 and 850ft, with a normal plant capacity of 17,700 kW and an annual output of some 46 million kWh.

In 1925 an additional hydro-electric station was constructed by the former North Wales Power Company at Maentwrog sited on the estuary of the Afon Dwyryd, to the west of Ffestiniog. Water from the gathering ground of the Afon Prysor was collected by an artificial reservoir, now Trawsfynydd Lake, which lies west of the main Ffestiniog-Dolgelly Road. This plant, which operates at a gross head of about 630ft, has a capacity of 24,000 kW and the annual output of the station amounts to approximately 32 million kWh.

Numbers of smaller hydro-electric plants exist on various rivers and small streams of North Wales. Notable among them is a small development on the River Dee at Chester where, at very low heads ranging from 3ft to 6½ft created by the use of a dam erected across the river, a small local supply of some 1½ million kWh/annum has been given for some years.

GENERATING PLANT

Record Amount Installed Last Year

MORE electricity generating plant was put in operation in 1949 than has ever before been installed in any one year in this country. The amount was 826,250 kW, raising the total installed capacity of the B.E.A. to 13,603,567 kW.

Station	Generating Sets (kW)	Boilers (lb/hr)
Bradford	Two 22,500	One 180,000
Cliff Quay, Ipswich ...	Three 45,000	Five 365,000
Deptford (East) ...	—	Two 225,000
Dunston "B," Newcastle	One 50,000	—
Grimsby	—	Two 80,000
Hams Hall "B," Birmingham ...	One 53,500	Three 320,000
Hartshead, Stalybridge	One 31,100	—
Kearsley, Lancs. ...	Two 52,000	Seven 173,000
Kingston, Surrey ...	One 3,000	—
	One 30,000	One 260,000
Leicester	One 31,500	Two 175,000
Lincoln	One 20,000	One 120,000
Littlebrook "B," Kent	One 60,000	Two 265,000
Meaford, Stoke ...	—	One 240,000
Nottingham ...	One 53,500	—
Portishead, Bristol ...	—	One 250,000
Rotherham	One 50,000	Two 200,000
Stuart Street, Manchester	One 61,500	Two 400,000
Walsall	Three 30,000	Four 150,000
West Ham	One 30,000	One 180,000
Woolwich	One 750	—

The figures may be compared with the 503,250 kW installed in 1948 and with the average of 298,500 kW for the four preceding years; the best pre-war figure was the 761,500 kW of additional plant brought into operation in 1938.

The increase of output obtained from the new plant commissioned last year was equivalent to 703,000 kW, the difference being accounted for by limitations of boiler capacity and other causes.

Altogether 22 new turbo-alternators and 37 boilers were put in operation (see table).

In addition to the tabulated plant, certain items were completed and made ready for service, but could not be commissioned because associated equipment could not be finished in time. These items included a 50,000 kW set at Dunston "B," a 60,000 kW set at Staythorpe, two boilers of 180,000 lb/hr at Ferrybridge, Yorks, and one boiler of 265,000 lb/hr at Littlebrook. If these had gone into service before the end of the year the installed capacity would have been 936,250 kW.

VIEWS on the NEWS

By REFLECTOR

IS restriction of the use of electricity for lighting shop windows to be eased? There has been a difference of opinion between the Ministry of Fuel and Power and the B.E.A. on this question. I believe that last autumn the latter urged the former to extend the permitted time by one hour, but the Ministry did not accept the recommendation. The matter seems to have been discussed again recently.

★ ★ ★

Beacon, the magazine of the B.E.A. North Western Division, reproduces a card distributed by the City Electricity Department of Nijmegen, Holland, which shows that they, too, have a peak-load problem. The card, illustrated by humorous sketches, tells housewives that "Klaartje Kilowatt," who is at their service day and night and who irons, vacuum cleans and cooks for them, lights and warms their homes, and gives radio entertainment, is tired. Her guardians therefore ask that she should be given a rest twice a day, namely, from 7 a.m. to 9 a.m. and 4 p.m. to 6 p.m. I gather that the average citizen of Nijmegen is an early riser, for our own morning economy period starts at 8 o'clock.

★ ★ ★

I have just received a copy of the one hundredth edition of *The Central*, the journal of the old students of the City and Guilds College, which first came into being in 1884. Among other special features to mark the occasion is a new cover designed by Henry Wilkinson to emphasize the connections of the College without departing radically from the tradition of including the arms of the Corporation of London and the Livery Companies. The issue contains greetings from several eminent Old Centralians and from past editors of the journal. There are notes on many other well-known members, and further interest is added by a review of the activities of the City and Guilds of London Institute and the inclusion of the story of the production of *The Central*.

★ ★ ★

While the filtration of women into the electricity supply industry has long been an accepted fact, as indeed it has in industry generally, women's organizations have rarely been invaded by men, and then only by special invitation. It is interesting to learn, therefore, that the Electrical Association for Women is holding, on 30th November next, a new certificate examination for electrical sales assistants, for which both men and women are invited to enter. The only qualifications for entry are at least one year's experience in a showroom or other commercial organization, and an age limit of not less than seventeen years. It will be interesting to see how the male sales assistants compare with their female counterparts when they are put to the test.

★ ★ ★

About a month ago I reported a complaint that the British Electricity Authorities did not employ Welsh-speaking officials to explain its schemes for the Principality. The need for bilingualism was demonstrated at the inauguration of a supply to Brynsiencyn, Anglesey, when a local bard sang a hym of praise to the Merseyside & North Wales Electricity Board. The chorus went:—

"I Manweb Lydd'or clod
I Manweb Lydd'or clod
Hwre am olan disglair
Mae'r trydan wedi dod."

which, according to "Contact," the Board's magazine, may be freely translated as: "To Manweb the praise—To Manweb the praise—Hooray for the bright light—The electricity has come." "Manweb," of course, is an abbreviation of the Board's unwieldy title.

AREA BOARDS' REPORTS

Summary of First Year's Working

THE first annual reports of the fourteen Electricity Boards, five of which are here briefly reviewed, cover the period from 1st January, 1948 (when they were constituted), until 31st March, 1949; the accounts relate to the operational year commencing 1st April, 1948. Certain comparisons with the previous year (such as increase in electricity sales) are approximate owing to the varying forms of statistical records in operation before vesting day.

LONDON

So that there should be no delay in catching up with the wartime arrears of construction work, the London Electricity Board, when it took over, decided that schemes sanctioned by the former undertakings should proceed without interruption provided that they conformed to the Board's general engineering policy. Distribution system reinforcements and extensions of approximately 132,000 kVA were provided during the year. A preliminary survey of works necessary to meet the contemplated demand showed that over a three-year period the capital expenditure would amount to some £15½ millions for the distribution systems up to 11 kV and £7 millions for the Board's higher voltage transmission systems. In the latter category are included 15 additional main bulk supply substations and the reinforcement of 21 existing points. This work has been given the highest priority.

The functions of the distribution control centre at Streatham are being extended to cover the main systems throughout the Area, and subsidiary control centres are being established in the Sub-Areas. Of the total load on the Board's system, approximately 85 per cent was supplied by a.c. (much of it from non-standard systems) and 15 per cent by d.c. A small measure of standardization was achieved during other works but for the most part the general standardization of all supplies has had to be postponed for an indefinite period.

It is aimed to reduce the number of meter testing stations from the 38 at vesting day to seven ultimately and the work of unification has commenced.

At the end of the year the Board operated 742 vehicles, of which 95 were battery-electric.

On the commercial side, notwithstanding the unavoidable restriction of development, the Board supplied to consumers 8,400 cookers, 4,500 water heaters, 5,500 wash-boilers and 108,000 kettles and other small appliances; in the case of refrigerators, the number was limited to 1,000 by the shortage of supply. Revenue in respect of wiring installations and sale of apparatus amounted to £1,609,946, an increase of 16.5 per cent.

Discussions have been held with the associations representing the 53 public lighting authorities in the Area with a view to adopting a general policy of improved lighting, and to encourage this the Board has decided to introduce uniform maintenance charges.

Exact comparison with the previous year is not possible, but electricity sales are estimated to have increased by about 7 per cent. The number of consumers at the end of the year was 1,524,782, a net increase of 41,856.

SOUTH EASTERN

A survey of the South Eastern Area is being made to enable a co-ordinated development plan to be prepared. The amount of rural development carried out by the former undertakings was considerable and districts without a supply are mainly small hamlets or isolated premises. It is estimated that there are some 13,000 farms in the Area, of which about 6,200 are already supplied. Many noteworthy farm installations were provided during the year, including two "in bin" grain-drying plants which were among the first in the country.

The average number of kWh sold per consumer in 1948-49 was 2,230; for

domestic consumers alone, 1,364; and farming supplies, 4,097 kWh. Power consumers were responsible for 26 per cent of the kWh sold and 21 per cent of the revenue.

Contracting and sale of fittings transactions during the year comprised £85,466 from sales on hire purchase terms and £1,308,041 cash and credit sales and charges for installation and other services. More business could have been done if adeqate supplies of such apparatus as refrigerators and washing machines had been available.

Referring to the fact that the maximum demand occurred on a Sunday in March and was due to a large extent to the cooking load, the report points to the value of this type of load curve. During the year 34,239 new consumers were connected, making 893,269 altogether.

On the engineering side, early steps were taken to complete an examination of all major schemes, and approval was given to the completion of capital works estimated at March, 1948, to cost £1,910,354. The two largest system extensions completed during the year were Littlebrook-Orpington (£465,000) and Kingston-Esher (£145,000).

SOUTHERN

Total expenditure on engineering work completed by the Southern Board during the year amounted to £2,061,000. It also authorized further works to the extent of approximately £2,353,000, including the following: First stage of 33 kV reinforcement in Bournemouth District (£288,409); extension of Greenford 22 kV substation (£108,111); Slough-Taplow 22 kV feeder (£71,200); North Hyde - Belfont 22 kV feeder (£61,050); 33 kV supply to Bognor (£56,360); and temporary 132/22 kV supply to Slough (Board's portion) (£41,100).

Slough is the most important of the new bulk supply points being provided to meet the anticipated growth of load, the scheme involving the installation of a new 132/22 kV substation equipped with three 45 MVA transformers. For another new bulk supply point the 132/11 kV supply at Bourne Valley, Bournemouth, is to be augmented by a new 132/33 kV substation for the transmission of large blocks of power to Christchurch, Milton, Redhill, Fleetsbridge and other centres.

During the year 597 consumers were changed from d.c. to a.c., leaving 40,832 (4.45 per cent) on d.c., and 973 were changed to standard voltage, leaving 163,089 (18 per cent) on non-standard voltage.

The overall increase in the aggregate m.d. was 47,266 kW (7.2 per cent) and in sales 288 million kWh (12.4 per cent). At the end of the year there were 916,764 consumers, 41,260 having been connected during the year. These included 1,398 farms, making 9,927 now served, sales to which showed a very substantial increase—31.8 per cent. There was a reduction of 6.2 per cent in traction supplies as a result of the change-over to buses at Southampton and Portsmouth. An additional 4,737 public lighting points were connected.

TABLE I
Area Boards' Financial Results

Board	Trading Revenue*			Other† Income	Interest, etc., Charges‡	Net Revenue	Transfers to Central and Area Reserves	Balance Carried Forward	
	Sale of Electricity	Meter and App. Rentals	Surplus on Contracting and Sales of Fittings						
	£	£	£	£	£	£	£	£	
London	27,471,005	849,480	100,768	413,486	1,048,914	1,144,724	691,000	453,724	(1)
South Eastern ...	12,442,648	405,549	108,629	64,471	585,057	171,752	138,000	33,752	(2)
Southern ...	14,271,934	342,769	118,042	39,798	680,455	382,381	261,000	121,381	(3)
South Western ...	6,755,512	203,401	72,213	17,352	415,389	−106,487	—	−106,487	(4)
Eastern	18,104,204	417,692	108,677	99,787	921,239	−855,249	—	−855,429	(5)

* Revenue from the "Clow Differential" surcharge is excluded, being credited to suspense account. † Rents receivable other miscellaneous income and interest on hire-purchase and similar sales. ‡ Interest on consumers' deposits and B.E.A. charges in respect of interest and financing; no provision for income tax or profits tax was required.

A decline in the sales of all major domestic appliances except refrigerators and washing machines is recorded. From the revenue point of view this was partly offset by a large increase in sales of farming appliances, motors and commercial refrigeration, but the net overall result was a reduction (excluding purchase tax) of £52,500 (5.9 per cent) compared with 1947-48.

An analysis of appliances sold includes the following (previous year's totals in parentheses): Cookers, 8,408 (10,869); wash-boilers, 4,009 (5,481); water heaters, 3,058 (6,429); washing machines, 1,290 (842); refrigerators, 1,081 (1,022); radio receivers, 166 (466); fires and convectors, 2,993 (7,032); farming appliances, 359 (203); and motors, 433 (198). Total revenue from the sale of appliances was £777,935 (including purchase tax) and from contracting £1,044,636, the latter being an increase of £17,382.

EASTERN

In the Eastern Area—largest of the fourteen and predominately rural—reinforcement of the overloaded mains was the Board's primary task in its first year. Nevertheless, 144 villages and hamlets were connected to the supply and provisional plans for a co-ordinated programme to provide a supply to all those now unserved are being investigated.

As an interim measure the Board adopted a line rental scheme for supplies to farms and isolated premises. An annual line rental is charged for seven years, equivalent to 10 per cent of the estimated capital cost reduced by half the revenue on normal tariffs in each year, so that a farmer who makes the fullest use of electricity pays the smallest amount under the rental system.

Several major reinforcement schemes were prepared and proposals initiated for additional points of connection to the Central Authority's 132 kV system; when completed, these schemes will avoid the need to transfer large amounts of power over the Board's 33 kV and lower voltage systems.

During the year 447 miles of l.v. and 326 miles of h.v. mains and cables were added, and 773 new substations commissioned, the total increase in substation capacity with extensions being 193,458 kVA. New consumers numbered 51,542, including 1,546 farms, 49,255 domestic and business premises, 716 industrial consumers and 25 public lighting supplies. At the end of the year consumers numbered altogether 1,231,937.

Contracting work and the sale of fittings brought in a revenue of £2,922,990, with a gross profit of £571,277 and a net surplus of £108,677.

SOUTH WESTERN

Another mainly rural Area, the South Western, has a population density of only 376 persons per sq mile. As much as 55 per cent of the Area territory is beyond the reach of the existing 11 kV network, while a further 13 per cent has as yet no l.v. system. The 531,120 consumers (an increase of 24,000 during the year) are thus concentrated in 32 per cent of the

TABLE II

Sales of Electricity in Million kWh and Price Received Per kWh Sold

Board	Flat Rates				Two-Part Tariffs				Farming Tariffs		Large Power		Public Lighting		Traction		Total†	
	Lighting		Heating etc.*		Domestic		Commercial											
	Units	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.
(1)	242.3	4.74	267.7	1.24	1,340.2	1.22	381.5	2.21	0.2	1.56	1,272.1	1.38	55.0	1.19	96.1	1.17	3,655.2	1.61
(2)	79.3	5.49	240.3	1.30	942.6	1.30	198.7	1.76	9.9	1.44	481.3	1.11	22.5	2.13	24.0	1.23	1,998.6	1.48
(3)	83.6	5.10	234.8	1.19	883.2	1.32	239.1	1.80	8.8	1.33	799.0	1.15	16.4	2.67	18.7	0.99	2,283.6	1.48
(4)	53.3	4.02	152.7	1.23	538.2	1.25	78.4	1.82	11.3	1.59	330.2	1.12	8.8	2.16	0.2	0.92	1,173.1	1.38
(5)	93.6	5.00	282.4	1.30	1,379.9	1.21	218.1	1.71	15.7	1.47	1,168.6	1.08	21.6	2.46	128.2	0.99	3,308.1	1.31

* Including cooking, water heating and small power. † Excluding inter-Board sales.

Area. Of the 7,147 farms of five acres or more now connected only about half use electricity for agricultural purposes. There are some 27,000 farms without a supply, and on the basis of present consumption by farms these would add only 7 per cent to present sales of electricity.

The existing 33 kV network being inadequate to maintain even the present rate of development, work has started on a comprehensive plan for the reinforcement and augmentation of this primary network. In the next few years this will involve some 420 route miles of 33 kV overhead lines and the building of 48 switching and transforming stations. For rural electrification, a survey of undeveloped areas which has been put in hand is likely to take two years to complete. To speed up interim development a preliminary reconnaissance has been carried out to determine which localities can be served from the existing mains.

Reference is made to the financial problem. At current levels the Board's tariffs are said to be insufficient to permit of the financing of even marginal development at the rate at which it is demanded and at which the Board wishes to make progress. The immediate problem is to devise an interim scheme for securing adequate revenue from isolated premises where the costs of supply are so much above the average that spreading them would cause hardship to other consumers.

EUROPEAN POWER

Sixth Session of E.C.E. Committee

AT the sixth session of the Committee on Electric Power of the Economic Commission for Europe, M. Pierre Ailleret (Directeur des Etudes et des Recherches a l'Electricité de France) was re-elected chairman and M. E. H. Etienne (Chef de Section de l'Office Fédéral de l'Economie Electrique en Berne) vice-chairman.

In an opening statement, Mr. Gunnar Myrdal (E.C.E. executive secretary) remarked that the development of the Committee's work presented constructive possibilities, as well as a record of actual accomplishment. The Committee still had before it certain vital projects for alleviating the continuing electricity shortages arising out of the aftermath of the war.

While the E.C.E. Power Committee was an economic and technical body (not a financial one) its ultimate goal was "action calculated to result in the most sensible possible utilization of Europe's scarce resources for her power needs." The task of finding private funds in Europe for long-term foreign lending, even in the power field, was incomparably more difficult than before the war and, except in isolated cases, would probably require governmental or international assistance, either in the form of guarantees or otherwise. The economic development of Europe's power resources could hardly be imagined without effective international co-operation.

It was announced that Mr. Tony Rollman (director of the E.C.E. Steel Division) had also been given the responsibilities of director of the Power Division. He replaces Mr. James Houston Angus, whose services have been requested by United Nations headquarters as special consultant on electrical power development in connection with the United Nations programme of technical assistance for economic development.

Among items on the agenda of the current Power Committee session were: (1) matters relating to power plant equipment and standardization; (2) report on the possibilities of utilizing U.N. technical assistance funds; (3) reports from the Thermal Working Party, the Hydro Working Party, the Interconnections Working Party, the *ad hoc* Legal Working Party and the Liaison Group; and (4) consideration of future activities of the Committee.

The countries represented were: Austria, Belgium, Czechoslovakia, Finland, France, Italy, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom and the United States. An observer for Poland also attended.

I.E.E. and Engineers' Guild

THE January *Journal* of the Institution of Electrical Engineers contains the following note: "As the question of the propriety of corporate members of the Institution becoming members of the Engineers' Guild is raised from time to time, the Council wish to remind those concerned that the Institution is not permitted under its charter to deal with matters of remuneration or conditions of service. A corporate member in his personal capacity is free to decide for himself whether he joins the Guild."

NEW BOOKS

Pottery and Ceramics. By Ernst Rosenthal. Pp. 304; figs. 23 and plates 31. Penguin Books, Ltd., Harmondsworth, Middlesex. Price 1s 6d.

Despite its low price, this book by the consulting engineer and technical adviser to Bullers, Ltd., electrical insulator manufacturers, forms an exceedingly comprehensive work of reference to what is one of the oldest of human arts. After giving a brief history of ceramics, the book covers in detail methods of production, as well as dealing with individual branches of the pottery and clayware industry and the properties of the finished products.

Apart from its numerous mechanical uses, electricity is now finding increasing application for firing. Reviewing the latest methods, the author emphasizes that electric firing has many advantages which may outweigh its sometimes higher cost.

In view of the author's experience, the chapters on insulator porcelain and low loss ceramics are especially interesting. A glossary of terms used in pottery manufacture is provided.—W. R. C.

Steam Turbine Operation. By W. J. Kearton, D.Eng., M.I.Mech.E., M.I.N.A. Fifth edition. Pp. 435; figs. 258; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 25s.

The fact that this book has reached its fifth edition is proof of its usefulness. The installation of turbines is briefly outlined in the opening chapter, where consideration is also given to foundations, erection, assembly, alignment and steam piping. The need for pre-heating is treated next, together with the necessity for providing adequate drainage facilities. Turning gear, which has proved an important adjunct in the modern high-temperature turbine, could with advantage have been given further space. Glands and sealing are described in some detail and lubricating systems for both land and marine turbines are included.

The chapter on governors and governing is most comprehensive, while the section covering the starting and stopping of turbines is brief, but to the point. Other chapters deal with turbine troubles, testing and regenerative feed heating, the installation and operation of the Ljungstrom turbine also being treated exhaustively.

This book covers the various sections of turbine plant in such a practical manner that it should prove most valuable to all engineers and others engaged or interested in this work. The theoretical aspect of the problems involved has not been ignored, for the author has included such treatment where it is considered necessary to reinforce the descriptive matter.—T. H. C.

Private Companies: Their Management and Statutory Obligations. By Stanley Borrie, Solicitor. (Sixth edition.) 232 pp.) Jordan & Sons, Ltd., Chancery Lane, London, W.C.2. Price 8s 6d.

Since the appearance of the last edition of this work the Companies Act, 1948, has become law and this has necessitated a number of revisions. The author deals in considerable detail with the rights and obligations of private and public companies and their directors and members. Capital and dividends are treated, and there are sections on the conduct of meetings, annual returns and accounts, and other relevant matters. The book is a useful and convenient compendium of company law.—J. H. C.

Books Received

Magnetic Tape Recording. By P. A. Tarry. Pp. 64; figs. 12; index. Audigraph, Ltd., 7, St. Peter's Place, Birmingham, 1. Price 5s.

Mathematics of Circuit Analysis. By E. A. Guillemin. Pp. 590; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 60s in U.K.

Electric and Magnetic Fields. By S. S. Attwood. Third edition. Pp. 475; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 44s in U.K.

Design of Direct Current Machines. By L. Greenwood, M.I.E.E., M.I.Mech.E. Pp. 222; figs. 211; index. Macdonald & Co (Publishers), Ltd., 43, Ludgate Hill, London, E.C.4. Price 25s.

Protection of Small Motors

FUNCTION OF COMPENSATED THERMAL RELAY

By A. R. BLANCHARD*

SMALL motors that are damaged electrically invariably suffer a burn-out in one of the windings. This may result from a seized bearing, causing the rotor to be stalled, thereby imposing an overload exceeding about 130 per cent of the normal rating of the machine.

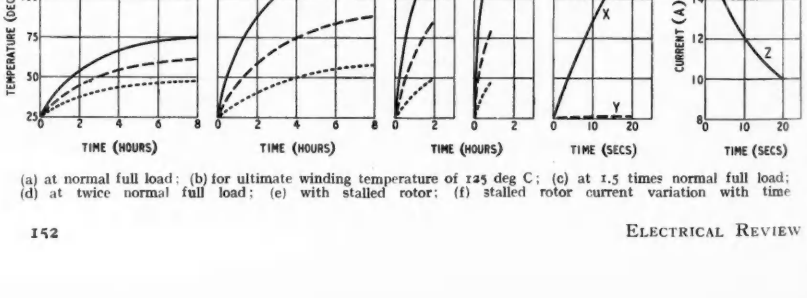
Such burn-outs may be guarded against in several ways, each of which suffers from one defect or another. For instance, the provision of a motor that is larger than is really necessary will reduce the risk of its being seriously overloaded; but this is hardly an economical proposition, especially for such household appliances as washing machines and refrigerators, in which cases the overall cost must be kept down for competitive reasons. Fuses cannot be made with a sufficient degree of accuracy to ensure that they always "blow" at the right current and, even if they could, they would prevent the motor being used up to the limit of its capacity in between the extreme conditions of stalled rotor and continuous slight overload. A thermostat would be ideal if it could be made small enough to be mounted right in the motor windings, since it would then interrupt the power input when the temperature of the windings reached an unsafe value. Unfortunately such a thermostat is not a practical proposition. When a thermal relay is used some sort of attempt is made to match it to the thermal characteristics of the motor, but as one type of relay is used for all shapes and sizes of motor of the same current rating, the matching is very imperfect indeed.

How, then, can one fully protect a motor against all types of overload? The basic problem is to prevent the windings reaching an unsafe temperature. Since we cannot do this, the next best alternative is to limit it by mounting a protective device in the motor, as near to the windings as possible, and by some means or other compensate for the difference between the temperature of the windings and the effective temperature at the protector position.

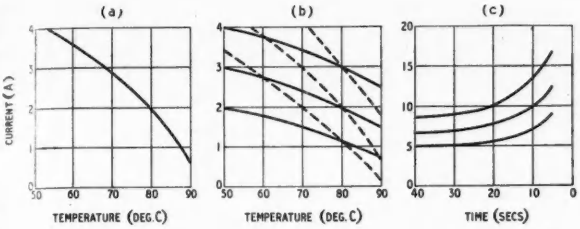
It will be convenient at this stage briefly to review the temperature gradients existing in a motor with (a) loads under which the windings never reach an unsafe temperature, no matter how long the motor is run, from zero through normal full load to a load of some 25-35 per cent above the normal full load;

* Salford Electrical Instruments, Ltd.

Fig. 1.—Temperature gradients in a small motor under differing current conditions
—— main winding, ---- air, ···· frame, x = starting winding, y = air and frame, z = starting and main windings



(a) at normal full load; (b) for ultimate winding temperature of 125 deg C; (c) at 1.5 times normal full load; (d) at twice normal full load; (e) with stalled rotor; (f) stalled rotor current variation with time



(a) for main winding temperature of 125 deg C; (b) overload characteristics with central dotted curve closely matching (a) curve; and (c) short time characteristics

Fig. 2.—Typical effective protector performance curves

Fig. 3. — Bimetal disc in Bakelite housing

Fig. 4.—Combination disc and heater arrangement

(b) load under which the windings just reach their unsafe temperature after many hours' running, which usually occurs at some 25-35 per cent above the normal full load current; (c) loads under which the temperature of the windings would pass beyond the maximum safe limit if the motor were allowed to run continuously, that is, loads greater than some 25-35 per cent above full load; (d) stalled rotor conditions.

If one measures the temperatures of the windings, the motor frame and motor air under each of these load conditions and at various times from starting we obtain curves similar to those in Fig. 1. The main point to be noted about Fig. 1(a), (b), (c) and (d) is that, at the maximum safe winding temperature of 125 deg. C, the temperature of the air and frame of the motor is lowest when the load is greatest. Therefore a protector mounted in the motor frame and in contact with both the frame and the motor air will have a lower temperature surrounding it at a heavy overload current, due to the thermal inertia of the motor bulk. This effect is most marked under stalled rotor conditions (Fig. 1(e))—when the winding reaches 125 deg C in a few seconds while the air and frame remain substantially at room ambient temperature.

These curves indicate the characteristics required of the protector. At loads insufficient to cause the main winding to reach a temperature of 125 deg C, no matter how long the motor is run, the protector must not "trip." In the case of Fig. 1 (a) and (b) a suitable protector must not trip up to 2.6A and at effective protector temperatures up to *very roughly* 75 deg C (the mean of the air and frame temperatures when the winding reaches 125 deg C after many hours' running).

At higher overload currents—Fig. 1 (c) and (d)—the protector must trip at lower effective protector temperatures; that is, at 3A with an effective protector temperature of *very roughly* 65 deg C and at 4A with an effective protector temperature of *very roughly* 60 deg C in the case of Fig. 1 (c) and (d).

By plotting these characteristics we obtain the curve of Fig. 2 (a), making it clear that under all load conditions the protector characteristics should match, or come very close to, this curve. In practice, as we shall see later, we arrange the protector to trip, not at a winding temperature of 125 deg C, but at or about 115 deg C, to allow for manufacturing variations between motor and motor and between protector and protector.

Under stalled rotor conditions the circumstances are somewhat different and requirements simpler, as we are concerned only with making sure that the protector trips before a winding temperature of 125 deg C is reached. In the case of Fig. 1 (e) the protector can trip at any time up to 20 seconds, the lower limit being determined by the starting time and current of the motor, usually a second or less. It is important to note (Fig. 1 (f)) that the current taken by a motor under stalled rotor conditions drops appreciably as the winding heats up, due to the rise in the resistance of the winding with rise in temperature.

We are now in a position to see how the desired protector characteristic is obtained. The bimetal disc mounted in its bakelite housing, Fig. 3, has current

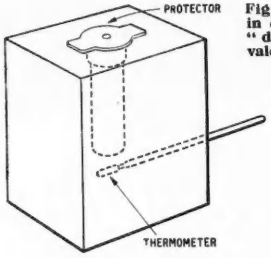


Fig. 5.—Protector in calibrating "dummy" equivalent of motor

passing through it. The disc will "snap" over to an inverted saucer shape as soon as it itself attains a certain predetermined temperature. The temperature of the disc depends on the temperature of the air surrounding it and the temperature of the bakelite housing; also on the current flowing through it, which causes heat due to I^2R losses. Thus one particular disc can be made to snap over at 2.6 A and air and bakelite temperatures of 85 deg C and 60 deg C respectively (equivalent to the motor characteristics in Fig. 1 (b); at 3 A with air and bakelite temperatures of 85 deg C and 50 deg C respectively (see Fig. 1 (c)) and at 4 A with air and frame temperatures of 80 deg C and 45 deg C (Fig. 1 (d)). At the same time the disc can be arranged to snap over at 10 A in a time somewhere between, say, 2 and 20 seconds—Fig. 1 (e) and (f).

For general use in the many different types of motor available to-day it is not economical to make a separate disc for each type. Instead, the desired characteristics are obtained by using a combination of disc and heater mounted in close proximity to the disc, the same current passing through it (Fig. 4). Thus with, say, 10 different types of disc and 10 types of heater, 100 different types of protector are available.

One important difficulty arises in fitting a protector to a motor. The effective protector temperature is *very roughly* half-way between the motor air and frame temperatures. How close it is to one or the other will depend on the motor design, and it is not possible to measure this temperature directly. The same difficulty arises in specifying characteristics for the protector.

It is overcome by using an arbitrary standard, obtained by fitting a protector in a "dummy" (Fig. 5) which may or may not be the equivalent of any practical motor. If a protector so calibrated is placed in a motor and the current (from a separate source) required to trip it at different motor currents is observed, the effective protector temperature at each of these motor currents will be immediately obtainable. Then from the characteristic curves for other types of protector, the one most nearly matching the motor characteristic can be selected.

Appropriate protector selection data can be obtained from the author.

Radio Industry's Achievements

THE television transmitter at Sutton Coldfield, near Birmingham, and the radio relay and cable systems which link it with Alexandra Palace, London, are placed first among achievements of the industry in 1949 in the annual report of the Radio Communication and Electronic Engineering Association, which held its annual general meeting in London on 20th January.

Equipment for radio communications, broadcast transmission, navigational aids and industrial electronics—not including domestic radio or components or valves—was exported during the first nine months of 1949, according to Customs and Excise figures, at the rate of £3,250,000, approximately the Association's share of the radio industry's target. In addition it is estimated that indirect exports, in the form of equipment installed in ships and aircraft and as part of engineering installations, were worth an additional 50 per cent or more.

Electric Fences

IT is announced that a technical report Ref. W/T 18 entitled "Electric Fences," by A. E. Canham, M.Sc.(Eng.) and R. G. Part, B.Sc.(Eng.), is now available from the British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey, price 2s, plus 3d postage. The report opens by discussing the use of the electric fence as an alternative to the more orthodox types of fence, and continues by contrasting the types of controlling unit available in this country with those abroad. An account is given of tests carried out upon three British units which are on the market to check their compliance with B.S. 1222-1945 and to determine whether they could be altered, intentionally or otherwise, in such a way as to increase the severity of the shock given by them.

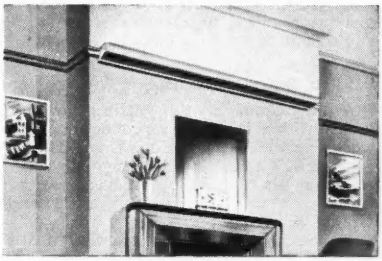
RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PROJECTS

Domestic Fluorescent Lighting

A DOMESTIC cornice lighting fitting incorporating a 4ft 40 W fluorescent lamp is now available from THORN ELECTRICAL INDUSTRIES, LTD., 109, Judd Street, London, W.C.1.

Instead of the conventional inductive ballast the circuit includes a pure resistance in series with the lamp. Although this raises the rating of the fitting to 84 W at 210 V it has the advantage of noiseless operation as well as reducing the weight of the assembly and the price. Glow switches and "Atlas Quickstart" graded 40 W lamps are employed and the fitting is furnished with suspension hooks to fit over picture rails or suitable wooden blocks.



"Atlas" domestic fluorescent lighting fitting

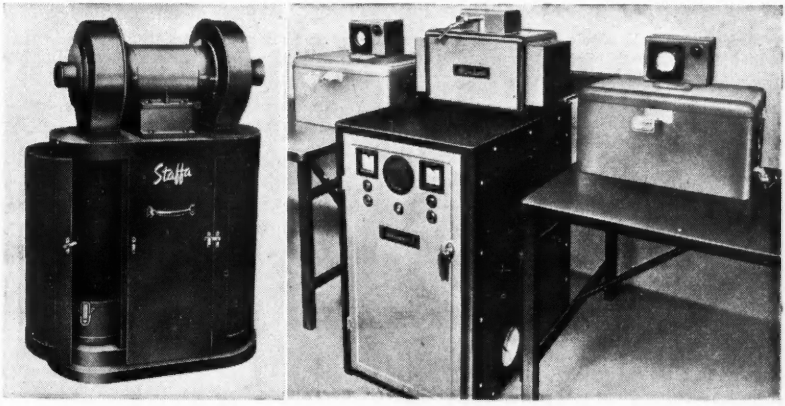
Dust Extractors

A twin portable dust extraction unit, suitable for attachment to existing industrial machines is now being made under the trade name of "Staffa" by COMMERCIAL STRUCTURES, LTD., Staffa Works, Staffa Road, London, E.10. Driven by a 2 h.p. three-phase 400/440V motor it incorporates two centrifugal suction paddle blade fans, which discharge the dust laden air through two linen fabric tubes into separate removable canisters, each inlet being capable of handling 600-650 cu ft/min. A smaller unit otherwise identical in design and shape, can handle half the volumetric capacity.

R.F. Heating Equipment

The flexibility of the 4 kW r.f. heating equipment made by STANDARD TELEPHONES & CABLES, LTD., Connaught House, Aldwych, London, W.C.2, has been improved by the introduction of a model with two work stations, each of which is operated from the main unit. This enables the generator to be kept in full operation, eliminates handling time and reduces capital expenditure. Each station incorporates a variable water-cooled output transformer. The work

"Staffa" double inlet dust extractor unit and (right) S.T.C. dual-station r.f heating equipment



to be handled is jigged and a heating coil is attached to each head. Then, by means of a control on the main unit, it is set for the optimum heating ratio. Automatic control is provided by a process timer mounted above each work station which is switched into circuit by the same switch as is used to change over the r.f. power. In the standard unit, the work stations are adjacent to the generator but if necessary they can be at a distance of up to 30ft.

Flameproof Lighting Fitting

A flameproof lighting fitting for 60 W lamps which is now in production at the works of the BELMOS CO., LTD., Bellshill, Lanarkshire, has been designed to the requirements of BS.889. It has been certified by the Ministry of Fuel & Power for Groups 1, 2 and 3 gases.

Manufactured in silicon aluminium alloy, the fitting weighs only 12 lb. The well glass is of "Armour-light" glass so the standard fitting is not furnished with a guard as it is unnecessary. It is also announced that a slightly larger fitting for 100/150 W lamps is at present being developed and will become available in the near future.

Miniature Circuit Breaker

Measuring only $4\frac{3}{8}$in high and $1\frac{1}{2}$in wide, a single-pole circuit breaker, which has just been placed on the market by SIEMENS-SCHUCKERT (GREAT BRITAIN), LTD., Great West Road, Brentford, Middlesex, affords full protection to both d.c. and single-phase a.c. apparatus having a current consumption of up to 30A at 250V. It is available in 5, 10, 15, 20, 25 and 30A sizes and incorporates both an instantaneous magnetic short-circuit release, which also operates on 7 to 8 times the rated current, and a bi-metal time-lag release with an inverse characteristic.

A feature of the device is the provision of a neutral link which is operated automatically by the action of the main contacts.

Siemens-Schuckert miniature single-pole circuit breaker

While the moulded cover and base of the circuit breaker are black, the operating handles are coloured, a different colour being provided for each current rating.

Hair Dryer

Light weight, good balance and comfortable grip have been achieved in the electric hair dryer brought out by PIFCO, LTD., Watling Street, Manchester, 4. The attractive ivory plastic body with the switch control for hot or cold air in the handle, measures 7in by $8\frac{1}{4}$in by $3\frac{1}{2}$in. The universal motor has self-aligning and self-lubricating bearings and is designed to operate on any voltage between 200 and 250. A 100/120 V model is also available. The loading is 50 W for cold air and 550 W for hot.

Floodlight Projector

Using a 1,000 W projector lamp a heavy duty weatherproof floodlight, made by METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, is designed for concentrated beam, diffusing beam or rectangular throw according to the type of front selected, the focus being adjusted externally.

The body is made from silicon aluminium alloy casting with a cast stirrup of the same material, and with an internal reflector of polished anodized aluminium. A cast hinged ring carries a heat-resisting glass front and the cable is taken through a packing gland to a cool wiring chamber.

(a) (b) (c)

(a) Belmos 60 W flameproof lighting fitting

(b) Metropolitan-Vickers floodlight projector

(c) "Pifco" hair dryer

The Year's Progress

Further Details of Manufacturers' Work in 1949

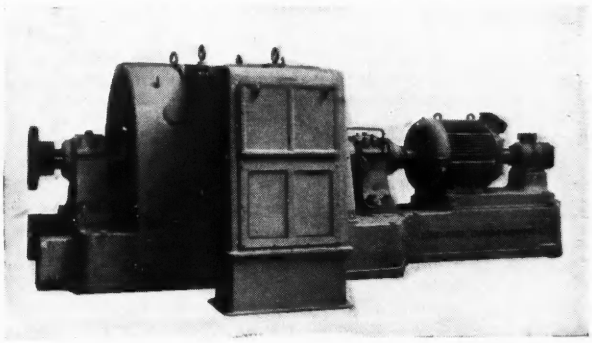
OF the dynamo-electric machines manufactured last year by **Lancashire Dynamo & Crypto, Ltd.,** an unprecedentedly large proportion was of the larger sizes. This is acknowledgment that, for numerous locations, totally enclosed fan-cooled machines or totally enclosed closed-air-circuit machines offer many advantages. Typical machines included a "Fankuld" d.c. motor continuously rated at 195 b.h.p., 520/1,040 r.p.m., 400 V, for driving a gas booster through speed-increasing gears in the south of England. Four others of the same type and frame size, but continuously rated at 245 b.h.p., 540/810 r.p.m., 440 V, supplied to a steel works in South Africa for driving induced-draught fans, are believed to be the largest totally enclosed fan-cooled d.c. machines ever built. They have hollow cooling fins round the outside of the magnet case, an internal fan to circulate air through the wound components and the inside of the cooling fins, and an external fan to blow cooling air over the outside of the fins.

A flameproof "Corcooled" two-speed squirrel-cage motor for driving a compressor at an East Surrey gas works, continuously rated at 410/205 b.h.p., 985/496 r.p.m., 400 V, 50 c/s, three-phase, embodies cooling tubes between the stator core and the outside of the stator frame for the same purpose as hollow cooling fins. These motors can be supplied for outputs up to 1,000 b.h.p., either plain T.E.F.C. or certified flameproof.

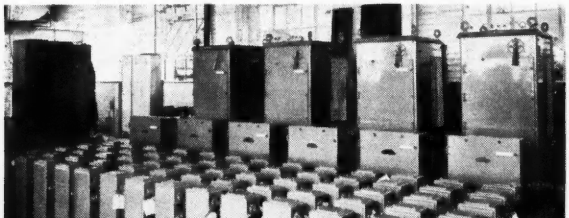
Duplicate revolving field alternators, each of 2,000 kW (m.c.r.), 1,000 r.p.m., 6,600 V, three-phase, supplied to a gas works in the London area, to be driven by geared turbines, are totally enclosed with closed-air-circuit side-mounted water coolers, a "Fankuld" main exciter and a totally enclosed pilot exciter. Other such sets supplied during the past year included two of 1,500 kW for a power station in Nigeria.

Duplicate 1,550 b.h.p. continuously rated 1,490 r.p.m., 3,150 V, three-phase slipring motors supplied to a London power station for driving boiler feed pumps are fitted with side-mounted water coolers.

During 1949, L.D.C. supplied for boiler-house auxiliaries over 1,300 motors with "Fankuld," "Corcooled," or closed-air-circuit enclosures. Machines of open, drip-proof and splash-proof types included a 2,000 b.h.p., 250 r.p.m., 3,300 V, three-phase self-starting synchronous motor for driving a wood grinder in an Australian paper mill. Nine others of similar type, but rated at 150 b.h.p., 300 r.p.m., were supplied to the same customer. Of a batch of open 6,600/3,300 V, 300 r.p.m., self-starting synchronous motors supplied for driving compressors in South Africa, nine are continuously rated at 1,000 b.h.p.,



One of two revolving field L.D.C. 2,000 kW three-phase 6,600 V alternators with side-mounted air-water coolers and "Fankuld" main and totally enclosed pilot exciters



Part of a large order for Brookhirst motor controller equipment for shipment to Egypt

seven at 805 b.h.p. and one at 870 b.h.p.

Motor control gear deliveries during the past twelve months by **Brookhirst Switchgear, Ltd.,** to the B.E.A., Gas Boards and the National Coal Board alone represented a considerable amount of equipment, and output figures constituted a new record. At the same time, new building projects to increase the company's production capacity should still further shorten dispatch. A notable contract was for several multi-motor control boards for the heating and air conditioning systems of the House of Commons now being rebuilt.

Export sales, which comprise a fair proportion of the company's output, included one large order for shipment to Egypt of standard motor control equipment for use in a chemical fertilizer plant, covering some 350 starting panels for motors ranging from ½ h.p. to 350 h.p. The starters, totally enclosed in weatherproof cases, were assembled on frameworks and provided with busbars to form a number of motor control boards.

Design has generally followed established practice, but the inclusion of a "live" flow diagram of the controlled plant—a feature which this company developed several years ago—has been increasingly exploited, particularly in material handling schemes. One of these boards was designed and manufactured for Lever Bros.' Port Sunlight Works.

Marine equipments have been supplied for the m.v. *Rangitoto* and the m.v. *Rangitane* (New Zealand Shipping Co.); and s.s. *Peleus* (Alfred Holt & Co.'s Far Eastern Service).

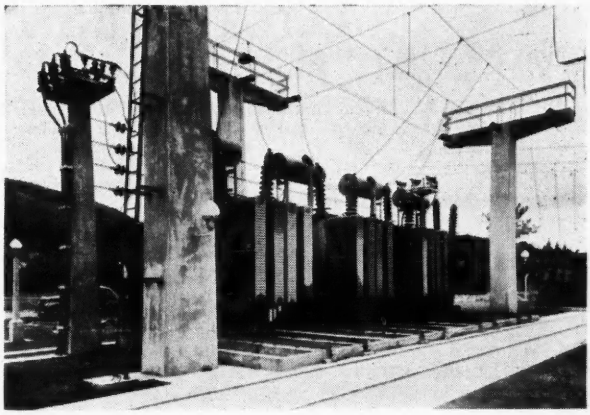
On the machine tool side orders are in hand from British machine manufacturers for equipping tools to be exhibited at Canadian exhibitions later this year. The control gear has been modified to comply with Canadian Standards Regulations which, although basically similar to those applying in this country, are different in detailed application

This year has seen the introduction into the production lines of the company's completely new range of a.c. starters of all types, a particular feature being the flexibility of design which permits the easy provision of extra features not normally provided in standard motor control equipments, such as inching, reversing, pilot lamps, etc.

Important orders for transformers have been secured by **Ferranti, Ltd.,** from Australia, South Africa, Argentina, Denmark and New Zealand. Generator transformers again figured prominently in the manufacturing programme; orders came from abroad for 28,000 kVA and 36,000 kVA three-phase units, while the third 87,000 kVA generator transformer for Battersea will bring the total installed kVA of Ferranti generator and feeder transformers at this power station to approximately three-quarters of a million. Two of 60,000 kVA, 132 kV, three-phase with on-load tap changing gear were installed at Halifax substation.

Fully automatic moving coil regulators for 11 kV and 22 kV at 2,500 kVA were shipped abroad during the year. A combined regulator and transformer was made which is capable of delivering 3,000 A at an automatically controlled output of 230 V with variations of input voltage between limits of 244 and 216 V.

The attention being focused on elec-



Four single-phase Ferranti 10,000 kVA transformers at Karapiro in New Zealand

tricity tariffs gave the capacitor section a busy year; among power factor correction schemes carried out for various industrial plants a number of fully automatic systems were installed. A number of 400 kVA(r) 11 kV capacitors were built for use on an 11 kV overhead transmission system.

An order has been secured from Argentina for a 1,000,000 V impulse plant and from Norway for a 1,200 kVA 600 kV cable testing equipment.

In conjunction with Wild-Barfield Electric Furnaces, Ltd., new h.f. industrial models have been developed for induction and dielectric heating.

BELGIAN ELECTRICAL TRADE

OPPORTUNITIES for United Kingdom manufacturers of electrical machinery are referred to by Mr. E. J. Joint, formerly Counsellor (Commercial) to H.M. Embassy at Brussels, in his report on the economic and commercial conditions in Belgium, published for the Board of Trade by H.M. Stationery Office at 1s 6d net. Mr. Joint says that a demand exists for electrical generating and transmission plant and apparatus of all descriptions. This has been intensified by electrification work on the railways, extensions of the telephone network, and by the construction of new rolling stock for the light railways and tramways.

Competition is very severe from the local industry and methods of tendering for open contracts place foreign firms at a disadvantage. Nevertheless, there are many opportunities for United Kingdom manufacturers to obtain orders, especially for specialized equipment. There is a demand for smaller items of electrical equipment, including cables, fractional h.p. motors, small transformers and signalling apparatus, although competition from the United States, Holland and Switzerland is strong.

Boiler house plant supplied from the United Kingdom is popular and the United Kingdom occupies a predominant position for the supply of steam boilers, heaters and generators. Orders are being held up, however, until better delivery dates can be given.

Competition in radio receivers has become severe and the market is now saturated, but there is still some sale for components.

Dealing with the Belgian engineering industry, Mr. Joint says that the electrical plant industry is prosperous, especially in heavier equipment and cables, but some specialities (e.g., fractional h.p. motors) are unable to meet the prices of the imported article.

Since 1945, the railway administration has worked hard to restore its pre-war efficiency. Plans have been published for the electrification within the next five years of 1,500 km of line at a cost of 14 milliard francs.

Mr. Joint's report also covers the Grand Duchy of Luxembourg, and he says that it is estimated that there will be a deficit of electrical energy in the Grand Duchy of about 90 million kWh a year in 1952, not counting a yearly consumption of 60 million kWh which the electrification of the railway system would entail. There are various hydro-electric schemes, including one for the building of a dam on the Our and Sur rivers.

COLLIERY WINDERS

Review of Current Practice

ELECTRICALLY driven winders for coal mines are the subject of a paper which was recently submitted by Mr. H. W. C. Liddiard to the Manchester Association of Engineers.

It commences with the Ward-Leonard arrangement in which speed control is achieved entirely by adjustment of the generator field. The paper then explains in greater detail how field regulation can be controlled by an amplidyne, which is virtually two machines in a common magnetic system. It is essentially a form of d.c. exciter designed for a large ratio between the power output and that needed to furnish the controlling excitation. The machine can have a number of field windings which can be connected in various ways for different types of control; a change of 0.1 W in excitation may result in a change of output of 1 kW, a ratio of 10,000 to 1. The manner in which the four fields of an amplidyne may be divided in opposition for the regulation of power factor is also explained.

A recent development is the adaptation of Ward-Leonard control to automatic working by means of cam gear actuated by two thrustors. This arrangement, in combination with amplidyne regulation, enables speed to be controlled much more precisely so that accurate stopping will occur independently of varying load conditions, which is one of the greatest difficulties in the satisfactory operation of an automatic winder.

The paper then turns to the geared a.c. winder arrangement in which reversal of rotation is brought about by contactors in the main stator circuit, while speed is controlled by varying the rotor resistance. It is often advantageous to use twin motors for driving an a.c. winder, with either parallel or series connections; a somewhat simpler (more commonly used in the United States) method is to use separate rotor resistances which is, however, not suitable for use with liquid controllers. Practically all modern winders are arranged for dynamic braking, the motor being used as a generator and the power so produced absorbed in the rotor resistances. The characteristics of this form of braking are outlined in the paper. The last five lines suggest that it would be quite practicable to employ a magnetic amplifier in place of the amplidyne and saturable reactors with rectifiers instead of the exciter. There is, however, some doubt whether the elimination of rotating ancillary machinery in this way would be any real advantage.

AUSTRALIAN ELECTRICAL PRODUCTION

Recently Published Statistics

PRODUCTION of electrical machinery and appliances in Australia in 1947-48, according to statistics recently issued in Canberra, was valued at £A27,891,000 compared with £A21,997,000 in 1946-47. In the preceding year it was £A17,000,000 and in 1938-39 just under £A7,000,000. Thus the value has approximately quadrupled in a decade. The principal lines of manufacture in 1947-48 are here tabulated, with notes of increase or decrease (one only) compared with 1946-47.

No comparative figures are available for the following (values in 1947-48 in £A000): Fans 324, irons 332, radiators and fires 163, toasters 190, washing machines 537, vacuum cleaners 840, radio receiving sets and parts 6,213, transmitting sets 529, other radio and amplifying apparatus 634. Nor is a total available for the production in 1947-48 of cable and wire which in 1946-47 amounted in value to £A1,455,000.

Class of Equipment	1947-48 £A(000)	Inc. or dec. on 1946-47 £A(000)
Alternators	69	−75
Generators	145	+61
Motors	1,746†	+601
Transformers and convertors above 20 kVA	501	−8
Ditto below 20 kVA	550	+177
Storage batteries and accumulators	2,876‡	+450
Apparatus for telegraphy and telephony	1,467	+142
Elec. meters	670	+179
Apparatus for regulating, starting and controlling... ...	2,022	+1,056
Household fittings	742	+193
Portable tools and appliances...	345	+227
Neon signs and "cold" lighting	810	+246
Measuring and recording apparatus	91	+10

† Including motors under 1 h.p., £833,000.

‡ Including £1,380,000 for radio and automobiles.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication
Responsibility cannot be accepted for the opinions expressed by correspondents

Welsh Water-power Proposals

FROM the letter of Mr. R. J. Taylor, in your issue of 13th January, in which he comments on certain statements by Mr. A. R. Cooper in the latter's recent broadcast, it appears that the statutory safeguards that already exist for the preservation of natural amenities are not so widely known and understood as they should be.

Consider, for instance, the procedure that has to be followed when it is proposed to erect a new overhead line. Before proceeding with the work, the Electricity Board concerned must: 1, obtain the consent of the Minister of Fuel and Power to the placing of the line; 2, obtain planning permission under the Town and Country Planning Act, 1947; and 3, obtain wayleave consent from each owner and occupier whose land is crossed by the line, or, in the case of a refusal, the consent of the Minister of Fuel and Power.

With respect to item 1, the Minister of Fuel and Power, before issuing his consent, must afford the local authority and the local planning authority the opportunity of being heard, as well as the County Council, if county bridges or roads are affected.

Under the provisions of the National Parks and Access to the Countryside Act, it is a duty of the National Parks Commission to advise local planning authorities and the Minister of Town and Country Planning on plans for development in the National Parks and areas of special beauty. It is clearly the intention that the National Parks Commission should be consulted on particular proposals for development which may be contemplated by statutory undertakings and other bodies.

Similar, and in some cases even more exacting, procedures are involved in respect of power-station construction works. Knowledge that these official safeguards of natural amenities exist may save some of your readers unnecessary worry and anxiety. They may also rest assured that preservation of natural amenities is a matter with which the Central Authority and the Area Boards are very much concerned.

L. J. LUFFINGHAM,
Public Relations Officer,
BRITISH ELECTRICITY AUTHORITY.
London, W.1.

Ring Mains

IT is probably unwise to enter into a controversy with Mr. Milne over the merits or demerits of this system for domestic premises, since it is obvious Mr. Milne clings to the practice he learnt in his early life.

I am rather surprised, however, to read "If we could depend on only qualified contractors, the ring main would have many advantages." This is surely a double admission that he has a sneaking regard for the system and that he has little faith in many of his fellow-contractors.

Ring wiring is ideal from many points of view, providing one fits an adequate number of socket outlets in the first instance and, as Mr. Gilbert mentions, a ring circuit earth wire is also run.

Initial provision for adequate outlets (easy with the ring main) would do away with the old and very bad practice of "sticking on" bits and pieces of wiring at a later date.

It is a pity that many housing authorities are reverting to the old practice of limiting outlets just to save a few shillings; this is surely false economy.

I disagree strongly with Mr. Gilbert when he condemns the B.S.1363 socket and plug. It has, at least, the merit of being a standard and will, as far as new premises are concerned, kill the silly idea of having several non-standard sockets and plugs available. The possibility of bridging fuse clips with any size of wire is perhaps a menace, but no more so than with any other fuse point in an installation. There is, however, available a par-

ticularly good make of plug top in which there are no fuse clips so making it most difficult to bridge the fuse contacts with anything but the fuse itself.

Jarrow-on-Tyne. R. DAVIDSON

Restriction on Fire Sales

IN your issue of 13th January your editorial signifies approval of the declaration of policy of this Board announced by our chairman, Mr. C. T. Melling, in restricting the sale of radiant-type electric fires.

You will be interested, no doubt, to hear that apart from one or two adverse criticisms, the reaction has been favourable and we can say generally is receiving a large measure of support. In particular, the chairman of the Eastern Regional Board for Industry has confirmed his approval of our action, and indeed has gone so far as to address a supporting letter to the national and local Press. With his permission a copy of the letter is enclosed which we feel would prove of interest to you.

Wherstead. E. A. FOWLER,
Chief Commercial Officer,
EASTERN ELECTRICITY BOARD.

[In his letter the chairman of the Eastern Regional Board for Industry (Mr. W. W. S. Robertson) says that as far back as three years ago his Board had referred to the difficulties caused by electric fires during the cold weather. He contends that they are more responsible than any other factor for the adverse effect upon the generating position and the consequent loss of production in industry. Under severe weather conditions electric fires can add a million kilowatts to the national demand at peak times. For these reasons the action of the Eastern Electricity Board is fully supported by the Regional Board for Industry.—EDITORS, *Electrical Review.*]

FARADAY LECTURE

The Development of Radar

THE free public Faraday Lecture, which is organized every year by the Institution of Electrical Engineers, was delivered in the Central Hall, Westminster, last week, by Dr. R. A. Smith, superintendent of the Research Department of the Telecommunications Research Establishment, Ministry of Supply.

The comparatively new branch of electrical engineering known as radar forms a subject of absorbing interest, and although its study is highly specialized and complicated, Dr. Smith explained "how it works" in such a simple and concise manner that even those with little or no knowledge of electricity could follow every step. In addition to a description of the wartime achievements of radar, reference was made to its peacetime uses and to recent developments as well as expectations for the future.

Dr. Smith said that in the first instance radar was developed to provide an early warning of approaching hostile aircraft, but by the end of the war there was hardly any field of operations in which it had not played an important part. In the air it had solved the problem of intercepting hostile aircraft, it had made possible the concentrated bombing of German industrial installations, towns and defensive positions, and it had played a major part in the defeat of the submarine. At sea, in addition to giving warning of enemy aircraft and ships, it was used in gunnery control and for keeping station in convoy. All these and several of the other uses to which radar was put during the war were described in comparative detail.

In his explanation of how radar works the lecturer referred to the measurement of range by means of pulses and the need for narrow beams which had resulted in progressive use of shorter wavelengths. The properties of centimetric waves were explained and the plan position indicator was described.

Turning to peacetime applications, Dr. Smith described how it could be used to map inaccessible territory and the way in which it was used in merchant shipping and for harbour control. He also showed how it gave safety in the air through such devices as the ground controlled approach system, which helped pilots to land their aircraft safely in conditions of low cloud or poor visibility. The lecturer also explained how radar was assisting in the examination of rain formation and clouds and in the study of meteors. He also described how radar techniques were being developed and applied to automatic following in astronomical telescopes.

The lecture, which was preceded by a short organ recital by Mr. T. E. Goldup, was illustrated by lantern slides and in addition there were several interesting demonstrations.

PERSONAL and SOCIAL

News of Men and Women of the Industry

MEMBERS of the Council of the British Engineers' Association recently elected as their president for the current year **Mr. K. Fraser,** M.A., A.M.Inst.C.E., M.I.Chem.E., who is chairman of W. J. Fraser & Co., Ltd., and a director of Babcock & Wilcox, Ltd., and Dewrance & Co., Ltd. He is a member of the Board of Studies in Chemical Engineering, London University, and of the F.B.I. Grand Council. The Council of the Association re-elected as a vice-president **Mr. D. D. Walker,** M.A., M.I.E.E., joint managing director of Evershed & Vignoles, Ltd., and **Mr. E. Bruce Ball,** M.A., M.I.Mech.E., was elected a vice-president. Mr. Ball is managing director of Glenfield & Kennedy, Ltd., and is also chairman of the British Valve Manufacturers' Association.

With the object of providing a more flexible and improved consumer service in Bristol, the South Western Electricity Board proposes, for commercial purposes, to split up the present large administrative unit of Bristol District into four sections, in each of which a commercial manager will be responsible for promoting and planning future electrical development. These commercial managers will be **Messrs. F. G. Lamb** (Bristol North), **H. F. Lidster,** Associate I.E.E. (Bristol South), **A. G. Parsons,** M.I.E.E. (Bristol Central), and **J. G. Ross** (Bristol East).

Mr. Lamb was formerly consumers' engineer with the Plymouth Electricity Department. Since December, 1948, he has been the Board's commercial publicity officer at the Bristol headquarters.

Mr. Lidster, who was district engineer and manager at South Molton to the Exe Valley Electricity Co., Ltd., became, on nationalization, the Board's branch manager at South Molton.

Mr. Parsons was district manager at Truro for the Cornwall Electric Power Co. and since vesting day he has been district manager for West Central Cornwall.

Mr. Ross joined Edmundsons Electricity Corporation in 1946 as commercial assistant, West Cornwall, and later became district manager at Penzance for the Cornwall Electric Power Co., and subsequently for the Board.

Mr. Frank Foulkes has been re-elected general president of the Electrical Trades Union by a large majority.

Mr. R. Turner, Motor Department manager of Brown Brothers, Ltd., has been appointed manager of Acton Branch in succession to the late Mr. G. A. Pemberton.

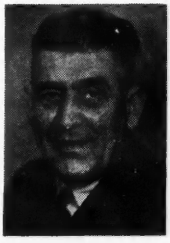
Mr. E. J. Bunbury has been appointed chairman of the Oriental Telephone & Electric Co., Ltd., and the China & Japan Telephone & Electric Co., Ltd., in succession to the late Sir A. Henry McMahon.

The Alpha Manufacturing & Electrical Co., Ltd., informs us that **Mr. S. H. Marshall,** J.P., M.P., a director of the company, is the Conservative candidate for Sutton and Cheam at the forthcoming General Election. Mr. Marshall has represented the constituency for many years.

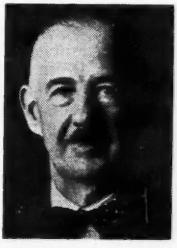
Mr. D. Murdoch informs us that he has resigned from the position as joint general sales manager of Truvox Engineering Co.,

Mr. F. G. Lamb

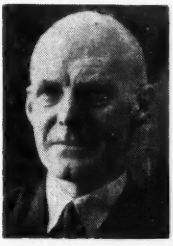
Mr. H. F. Lidster



Mr. A. G. Parsons



Mr. J. G. Ross



Ltd., to engage in the development of export trade connections, particularly in the dollar markets. His address is 46, Daver Court, Manor Street, Chelsea, London, S.W.3.

Mr. H. H. Andrews, until recently manager of the Traction Sales and Contracts Department of the English Electric Co., Ltd., and since 1948 adviser to the Traction Department, retired from the company's service on 31st December. A luncheon was held on 22nd December at which a large gathering of both English Electric officials and railway engineers from British Railways and elsewhere presented Mr. Andrews with a writing desk.

Mr. H. H. Andrews

Mr. Andrews was born in 1884 and was educated at University College, London. He spent some time in the Hampstead Corporation power station and later was on the outside erection staff of British Westinghouse. During 1912-13 he was engaged in traction survey work for a private mining enterprise in Turkey, and during the 1914-18 war served with the 2/5 Lancashire Fusiliers with the rank of captain. He joined the English Electric Co. in 1919 and in 1926 became manager of the Traction Tendering and Contracts Department, being promoted to assistant manager of the Traction Department in 1936 and manager in 1943.

Mr. C. L. Elvy, chairman of the Electrical Trades Commercial Travellers' Association, informs us that he is a supplier of wire and raw materials, and is not a representative of cable companies, as we stated in our last issue.

The music and drama section of Siemens Sports Club presented the **Siemens Players** in the play "Busman's Honeymoon," by Dorothy L. Sayers and M. St. Clare Byrne, in the company's sports club hall, Charlton Park Lane, on 6th and 7th January. The performance on 7th January was witnessed by the Mayor and Mayoress of Greenwich and the Mayor and Mayoress of Woolwich; Mr. G. W. Giffin, M.B.E., director and general works manager and Mr. W. G. Patterson, M.B.E., deputy general works manager, in addition to several other senior officials of the company.

The Elliott Long Service Association of **Elliott Brothers (London), Ltd.,** held its annual dinner at Chiesman's Restaurant, Lewisham, on 13th January. Mr. W. Phillips, M.I.E.E. (fifty-three years' service), was in the chair and among the directors of the company present were the chairman, Sir Walter Jenkins, C.B., C.B.E., and Mr. L. Bagrit, managing director. There are eighty-eight members of the Association still serving the company. Of these, a further six members were presented with gold badges to mark the completion of thirty-five years' service. Mr. A. H. Croxon, B.E.M., in proposing the toast of the company, mentioned that 1950 marked the 250th anniversary of the founding of the firm. Following the dinner, an excellent musical programme was enjoyed.

Children of **McKechnie Bros.'** employees were recently taken by motor coach to the matinée performance of the circus at the Bingley Hall, Birmingham, and afterwards to the works canteen at Rotton Park Street, Birmingham, for tea. The number was so large that it was not possible for all the young people to have their outing at the same time, so 181 had their treat on 14th January and the remaining 150 on 21st January.

The annual sports of the **Indian Cable Co., Ltd.,** were held on 15th January on the factory recreation ground at Tatanagar, Bihar, India. The heats had been run off on the previous Sunday and the finals of field and track events occupied for four hours the interest of several thousand spectators. The weather was excellent and the afternoon ran perfectly to the programme. After tea there was a fancy dress competition followed by the presentation of trophies and prizes to the winners by Mrs. D. J. McIntosh.

Miss Margaret Leader, senior housecraft adviser with the General Electric Co., Ltd., has been awarded the Elizabeth Sloan Chesser Cup for 1949. This is an annual award made to the demonstrator gaining the highest marks in the practical tests for the E.A.W. Diploma in Electrical Housecraft. The runner-up is Mrs. Hendry of Galashiels.

Miss M. Leader

Miss Leader, who has been with the G.E.C. for the past fourteen years, has undertaken demonstrations of the company's domestic cookers in the British West Indies and the Bermuda Islands, which she visited in 1938, as well as in many parts of this country.

Presenting their fourth annual pantomime "Robinson Ekco" in the Works Canteen, Southend, for a week's run from 16th to

21st January, the **Ekco Players** maintained the high standard of their previous shows. With the inclusion of the Ekco Theatre Orchestra under the direction of Mr. R. K. Spencer of the Development and Engineering Department, this was more than ever an all-Ekco show. Dressers, scenery artist, cast and orchestra were all employees of the company. The show was written by Clark Ramsay before he left last November and was produced by him.

Mr. J. F. B. Jackson, B.Sc., A.R.I.C., F.I.M., has been appointed director of research to the recently formed Research and Development Division of the British Steel Founders' Association. Before this appointment, Mr. Jackson was chief metallurgist and technical controller (foundries) to David Brown & Sons (Huddersfield), Ltd., whom he joined in 1933 as research metallurgist. In 1943, he became attached to the head office executive as chief metallurgist and technical controller (foundries). In 1946 he was appointed a director of David Brown-Jackson, Ltd.

Mr. J. F. B. Jackson

Mrs. Hooper sends her sincere thanks to all those friends and colleagues of her late husband, Mr. H. Hooper, for their contributions to the I.E.E. Benevolent Fund in lieu of floral tributes.

OBITUARY

Mr. A. Glynne Lobley, M.Sc., A.M.I.E.E., M.Inst.F., of Birmingham, died on 16th January at the age of sixty-two. Mr. Lobley, who was born at Hanley, Stoke-on-Trent, was educated at Newcastle-under-Lyme High School and the Victoria University, Manchester. For some years he lectured at Manchester and Sheffield Universities in electro-metallurgy and afterwards founded Birmingham Electric Furnaces, Ltd., now known as Birlec, Ltd., of which he was managing director at the time of his death.

The late Mr. A. Glynne Lobley

In addition to his business activities Mr. Lobley took an active part in political affairs; he represented Gravelly Hill Ward on the City Council from 1939 to 1945 and was chairman of the Technical Schools Sub-Committee. He was an hon. associate of the Central Technical College, Birmingham. The funeral took place at Erdington Parish Church on 20th January.

Mr. V. J. Perry.—The death has occurred at the age of sixty-five of Mr. V. J. Perry who had been on the sales staff of the Revo Electric Co., Ltd., for the last twenty-five years.

WILLS

Mr. H. McB. Fulton, J.P., electrical engineer and contractor, president of the Electrical Contractors Association of Scotland in 1937, who died on 24th April last, left personal estate in England and Scotland valued at £7,346.

Mr. M. Pratt, managing director of Pratt Bros. (Edinburgh), Ltd., electrical engineers and contractors, who died on 31st October last, left personal estate in England and Scotland valued at £13,209.

Mr. C. S. Hellstern, M.I.E.E., senior assistant electrical engineer at Worthing electricity works, who died on 28th September last, left £1,298 gross (£1,227 net).

Control Mechanisms

AUTOMATIC control mechanisms are not new, but during recent years such great strides have been made, accelerated by the need for extreme speed in gunnery, radar and industrial processes, that it is felt desirable to have some organization devoted to encouraging progress in this subject. Accordingly, it is proposed to form a Control Section within the framework of the Society of Instrument Technology. The Section is intended to cover the theory and practice of closed loop control systems, including servomechanisms, regulators, process controllers and the problems of the human operator as a controller and when part of a larger control system.

An inaugural meeting will be held on 28th March, at 6.30 for 7 p.m., at the Royal Society of Tropical Medicine and Hygiene, Mansion House, Portland Place, London, W.1, when three short papers will be read. Prof. K. A. Hayes will speak on the recent history and basic theory of servomechanisms, while Dr. A. Utley will discuss the problem of stabilization and Prof. A. Tustin will deal with the problems in control systems which await solution.

All interested persons are invited to attend this meeting and if sufficient response is obtained, the proceedings will be followed by a business meeting to deal with the actual formation of the Control Section.

Overseas Electrical Trade

Big Increase in Exports in 1949

ALTHOUGH the gradual decline in exports of electrical apparatus and machinery which has been apparent during the last quarter of 1949 was continued in December, the total for the month was, like the values for October and November, substantially above those for the corresponding months of 1948, while the grand total for the year at £122,339,128 was £18,546,396 above that for the previous twelve months. The actual figure for December was £9,543,681 compared with £9,965,513 for November and £9,456,023 for December, 1948.

From our table covering electrical exports during the year it will be seen that the increased sales abroad were fairly general throughout all sections of the market. Only sixteen out of the fifty-one classifications did not show improvements over 1948, these including rubber, cotton, silk or artificial silk insulated cables; domestic radio apparatus; radio valves; lamps and lighting apparatus, other than discharge lamps; radio accumulators; cooking and heating appliances; house service meters; permanent magnets; insulating materials other than insulating cloth and tape; generator parts; motors up to 1 h.p.; and convertors.

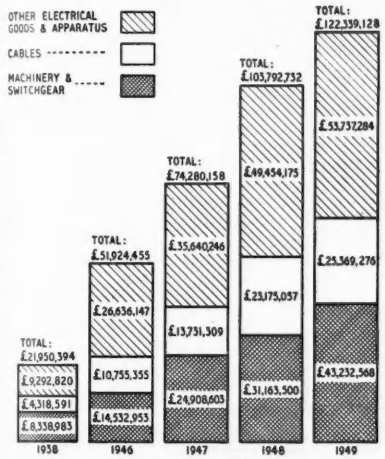
Electrical machinery, shipments of which rose from £31,163,000 to

TABLE 1.—ELECTRICAL EXPORTS

Class	1949	1948
	£	£
Telegraph and telephone wires and cables (submarine)	855,755	408,631
Ditto, not submarine ...	8,093,481	7,524,806
Wires and cables, rubber insulated	4,880,246	5,243,152
Ditto, cotton, silk or artificial silk insulated ...	829,510	839,353
Ditto, enamel, glass or asbestos insulated ...	995,648	410,685
Ditto, paper insulated ...	8,701,582	7,821,879
Ditto, other	1,013,054	926,551
Commercial radio apparatus	3,150,656	2,720,156
Domestic radio apparatus...	2,963,947	3,635,981
Telegraph, telephone and signalling apparatus ...	15,887,978	11,913,585
Radio loudspeakers ...	381,912	252,559
Sound reproducing apparatus components and parts, other than cinematograph apparatus ...	2,876,220	2,863,997
Other radio, etc., apparatus	665,016	583,898
Radio valves	1,868,285	1,947,918
Electric lighting carbons ...	156,798	134,241
Lamps, not exceeding 24 V	394,380	257,239
Discharge lamps	389,843	370,155
Other lamps	858,749	1,062,960
Other lighting apparatus ...	4,594,183	4,976,198
Primary batteries	938,687	720,490
Accumulators for motor vehicles	1,785,705	1,685,371
Ditto, traction	183,052	124,154
Ditto, radio	48,872	50,630
Other portable accumulators	789,390	462,151
All other accumulators ...	486,581	467,059
Parts and accessories ...	931,653	669,779
Cooking appliances... ...	1,315,199	1,772,367
Heating appliances... ...	707,500	865,674
Parts and accessories of cooking and heating appliances	465,213	411,799
Flat irons	398,718	392,608
Commercial electrical instruments	1,119,960	1,037,676
House service meters ...	1,495,023	2,208,171
Time recorders and time switches	151,461	135,297
Other electrical instruments	969,625	851,282
Electro-medical apparatus (not X-ray)	424,533	346,257
X-ray apparatus, tubes and parts	796,530	741,033
Permanent magnets ...	166,586	183,955
Insulating cloth and tape ...	829,251	652,995
Other insulating materials...	864,651	1,074,909
Unclassified goods and apparatus	4,681,127	3,881,631
Generators, up to 200 kW...	7,605,236	3,619,931
Ditto, over 200 kW ...	3,325,012	2,120,554
Ditto, parts	1,381,391	1,989,296
Motors, railway and tramway	280,449	155,675
Ditto, other, up to ½ h.p....	998,399	1,048,761
Ditto, from ½ to 1 h.p. ...	573,959	647,642
Ditto, from 1 to 250 h.p. ...	5,881,113	4,686,087
Ditto, over 250 h.p. ...	695,357	601,650
Ditto, parts	915,034	647,353
Converting machinery ...	84,773	102,033
Transformers, including coils	6,010,524	3,906,161
Rectifiers for power house use	335,150	263,473
Motor starting and control gear	2,139,770	1,727,872
Switchgear and switchboards (not telegraph or telephone)	9,395,788	6,788,935
Other electrical machinery...	345,233	379,685
Vacuum cleaners and parts	1,887,075	1,740,371
Other electrically operated portable appliances ...	1,378,305	738,021
Total	122,339,128	103,792,732

£43,232,568, was responsible for approximately two-thirds of the £18,546,396 increase in total exports. Generators of all sizes were in great demand though there was a falling-off in the requirements for parts: Russia was easily the biggest customer, taking £4,280,670 worth out of £12,311,639, with Australia (£1,163,285) and India (£1,069,650) as runners-up

The figures for motors reflect the general increased demand, noticeable in this country as well as abroad, for the larger industrial sizes, with fewer fractional h.p. units required. Although India increased purchases from £1,298,123 to £1,441,837, Australia with £1,445,936 out of a total of £9,344,311 has now taken



Comparison of exports of electrical machinery, cables, and other goods and apparatus

the lead as the largest buyer of British motors, South Africa occupying third place with £1,067,838.

India and South Africa were responsible for a substantial portion of the increase in the exports of other electrical machinery from £13,168,159 to £18,311,238. India's share rose from £2,299,041 to £3,416,557, while South Africa took £3,536,819 worth instead of £2,270,916. Russia reduced its purchases from £1,005,589 to £624,703.

Exports of electrical goods and apparatus as a whole rose by £6,477,328 to £79,106,560. South Africa, with a share valued at £10,967,860 (compared with £10,074,783 in 1948), was still our most important customer, but both Australia (£10,325,312 compared with £7,605,502) and India (£9,254,633 compared with £6,556,535) are rapidly catching up. Trade with New Zealand was also very satisfactory (£4,035,295 compared with £3,280,137) and a big advance

TABLE II.—DISTRIBUTION OF ELECTRICAL GOODS AND APPARATUS

Destination	1949	1948
	£	£
Channel Islands	387,019	458,326
Malta and Gozo	379,419	252,373
Cyprus	176,923	248,425
British West Africa ...	1,287,598	1,051,649
Union of South Africa ...	10,967,86[illegible]	10,074,783
Northern Rhodesia... ...	348,252	214,818
Southern Rhodesia... ...	1,376,994	955,534
British East Africa... ...	1,151,850	1,147,093
Bahrein, Koweit, Qatar and Trucial Oman	530,712	474,153
India...	9,254,633	6,556,535
Pakistan	1,289,216	777,106
Malaya	2,558,379	1,975,623
Ceylon	729,439	693,591
Hong Kong	1,872,305	1,180,597
Australia	10,325,312	7,605,502
New Zealand	4,035,295	3,280,137
Canada	1,045,675	733,351
British West Indies ...	1,177,940	835,222
Anglo-Egyptian Sudan ...	318,162	264,076
Other British Countries ...	895,875	734,534
Irish Republic	2,396,985	2,842,670
Soviet Union	634,147	463,147
Finland	414,850	453,066
Sweden	1,566,280	3,248,159
Norway	1,641,082	1,305,743
Iceland	231,136	197,438
Denmark	973,654	942,861
Poland	781,145	389,112
Germany	148,597	177,182
Netherlands	1,771,904	1,736,383
Belgium	899,919	1,189,689
France	718,529	616,486
Switzerland	389,401	414,024
Portugal	716,566	1,762,559
Spain	281,383	523,701
Austria	365,814	169,421
Hungary	179,916	151,615
Czechoslovakia	324,015	328,361
Yugoslavia	96,672	156,309
Greece	770,195	565,541
Turkey	750,057	1,307,796
Dutch East Indies	392,811	289,810
Dutch West India Islands...	97,438	119,652
Portuguese East India ...	340,086	252,203
Syria	423,321	229,803
Lebanon	395,945	279,290
Palestine	415,979	524,563
Egypt	2,189,661	2,068,950
Iraq	676,634	1,139,601
Iran	1,366,568	1,399,766
Burma	334,315	515,736
China	103,779	794,812
United States of America...	232,995	196,643
Mexico	147,724	88,192
Colombia	114,063	168,309
Venezuela	877,226	687,346
Chile	220,882	153,676
Brazil	808,873	1,075,886
Uruguay	210,961	206,112
Argentine Republic ...	,880,760	2,800,103
Other Foreign Countries ...	,715,334	1,182,088
Total	79,106,560	72,629,232

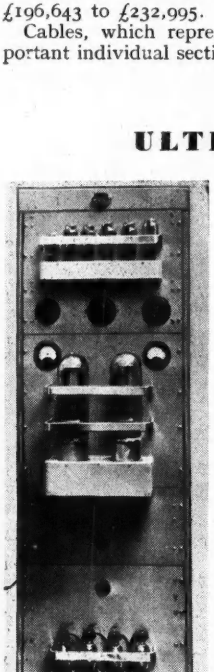
was made by Hong Kong (£1,872,305 compared with £1,180,597).

Less encouraging was the trade with Sweden (which declined from £3,248,159 to £1,566,280), Portugal (from £1,762,559 to £716,566), Turkey (from £1,307,796 to £750,057), and Iraq (from £1,139,601 to £676,634). The decline from £794,812 to £103,779 in purchases by China was only to be expected in view of the disturbed state of the nation's economy. Exports to dollar countries, though not representing a large proportion of the total volume of trade, were encouraging. Canada (£1,045,675) took £312,324 worth more, while the United States' purchases of British electrical goods rose from £196,643 to £232,995.

Cables, which represent the most important individual section of the electrical industry, are shown separately in the diagram indicating the growth of electrical exports since 1938 (p. 167): £2,194,219 worth more of them were exported than in 1948. The popularity of British telecommunication equipment continues to increase and exports rose from £11,913,585 in 1948 to £15,887,978 in 1949, the largest customers being Australia (£3,838,651) and South Africa (£2,854,041).

Imports of electrical apparatus and machinery at £4,008,576 remained at practically the same level as in 1948 (£3,930,479). Of the £3,136,313 worth of electrical goods brought into this country the United States supplied £912,706, followed by Canada with £559,284, the Netherlands £540,911, and Switzerland £140,045.

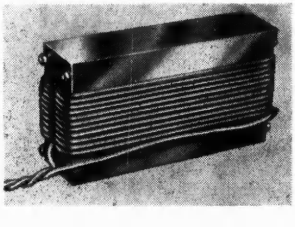
ULTRASONIC POWER UNIT



THE application of ultrasonic techniques to industrial processes may soon become a practical possibility through the use of equipment such as the low frequency magnetostriction generator which has just been introduced by Mullard Electronic Products, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

This generator follows the first commercial high-frequency quartz crystal generator for laboratory use which the company introduced a few months ago. Although the latter is of value in ultrasonics research, the limitation of its power to 500 W precludes its use in production processes. In the magnetostriction generator, however, which is at the moment intended primarily for experimental use, this difficulty has been overcome and standard units have been produced with outputs of up to 1 kW. Furthermore, there appears to be no limitation to the ultrasonic power that may be produced by generators of this kind.

The generator is in two parts, the main unit comprising a driving oscillator, power amplifier and low voltage d.c. power pack, together with necessary monitoring and check meters, and the transducer unit which is composed of a stack of nickel laminations wound with a common coil for excitation and polarization. The amplifier, which provides the source of power for the transducer, is basically similar to that in public address equipment and delivers a maximum output of 1 kW over a frequency range of 10 kc/s to 25 kc/s.



Mullard ultrasonic generator and magnetostriction transducer for industrial applications

Commerce and Industry

Industrial Mission to Pakistan
The Royal Exchange Carillon

THE British Government has accepted an invitation from the Pakistan Government to send an Industrial Mission to Pakistan. It will arrive in Karachi on 26th February, and will spend three weeks in Pakistan. The Mission will be led by Lord Burghley, K.C.M.G., and the electrical industry will be represented by Mr. F. C. Holroyde, vice-chairman of Crompton Parkinson, Ltd. The Mission's terms of reference are to explore and report to the United Kingdom Government on the steps which might be taken to assist the flow of trade in both directions between the United Kingdom and Pakistan, and particularly on the way in which U.K. industrial and commercial interest could assist further in the planning and execution of schemes which the Pakistan Government has under consideration for the economic development of its country and the expansion of its trade.

Contract Price Adjustment Formulae

The following are the contract figures for use in the B.E.A.M.A. contract price adjustment formulæ: the rate of pay for adult male labour at 14th January is deemed to be 115s (unchanged). Cost of materials: the Board of Trade index figure for intermediate products as on 14th January is 271.2 and is the figure for December (against 269.1 for November).

Birmingham Television Exhibition

The date is now announced by the Radio Industry Council of the exhibition of radio and television which it is to organize at Castle Bromwich, Birmingham, on behalf of the British Radio Equipment Manufacturers' Association. The exhibition will be open to the public from 6th to 16th September next. The B.B.C. will be co-operating.

The Seattle Contract

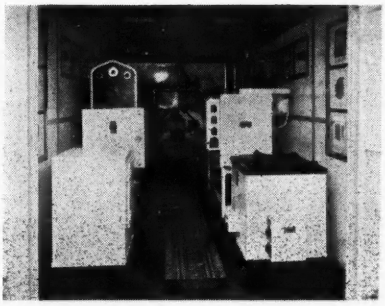
Ferranti, Ltd., Hollinwood, are making another effort to obtain the Seattle contract for electrical plant. Mr. F. Rostron, export sales manager, has asked the superintendent of the Seattle City Light Co. to urge the City Corporation to re-advertise the contract. Ferranti's, said Mr. Rostron, had complied with requirements after a misunderstanding, only to have the bid rejected. Theirs was one of the two British tenders rejected, although they offered up to £74,000 less than prices quoted by United States competitors. Ferranti offered nine water-cooled transformers for £250,000 (£35,000 less than the cheapest United States offer) and also said they would provide six forced oil-cooled transformers for £183,000 (£73,000 less than United States). The English Electric Co., Stafford, offered two rectifier units and switchgear for £45,000, which was £8,000 lower than the nearest United States figure.

Packaging Exhibition

The London Packaging Exhibition will now be held in the National Hall, Olympia, from 30th January to 9th February, 1951. In the preliminary announcement it was indicated that an option had been obtained on the Empire Hall, Olympia, for November next, but subsequently the organizers were able to obtain the National Hall, which is considered a better venue.

E.D.A. Area Lectures

In the series of E.D.A. Area sales lecture meetings, and following similar meetings in London and Newbury, a lecture was given at Bournemouth on 12th January, by Mr. H. D. Barlow, of Barlow-Whitney, Ltd.,



A Barlow-Whitney demonstration van at an E.D.A. sales lecture meeting at Bournemouth

The travel and information bureau introduced at the works canteen of George Ellison, Ltd., and Tufnol, Ltd.

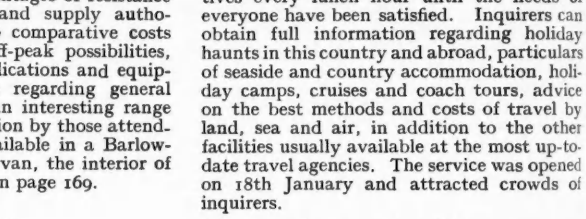
who spoke on the applications of electric resistance heating in industry. Mr. H. E. White presided. The ground covered included some of the advantages of resistance heating to consumers and supply authorities, with reference to comparative costs with other fuels and off-peak possibilities, examples of typical applications and equipment, and information regarding general design requirements. An interesting range of equipment for inspection by those attending the meeting was available in a Barlow-Whitney demonstration van, the interior of which is in the picture on page 169.

Batteries for Ankara

The Tudor Accumulator Co., Ltd., has supplied five storage batteries for the new building of the Turkish Great National Assembly in Ankara. They consist of two batteries of twelve cells with a capacity of 101 Ah at the ten-hour discharge rate, a 30-cell battery of 37 Ah, and two, each with 12 cells of 41Ah capacity

"Creda" Cooker Display

In the accompanying picture we show an effective display of "Creda" cookers, made by the Simplex Electric Co., Ltd., which has recently been arranged in the showroom windows of the No. 4 Sub-Area of the Yorkshire Electricity Board.



The "Creda" cooker display in a Y.E.B. showroom window

George Ellison's Holiday Bureau

The large increase in the numbers of workers entitled to holidays with pay has meant a decrease in the holiday accommodation available, and many are anxious to make their arrangements before the usual rush commences. A novel scheme as been evolved by the joint companies of George Ellison, Ltd., and Tufnol, Ltd., to assist employees in their efforts to decide where to spend their holiday and how to get there. A complete travel and information bureau has been erected in the works canteen and arrangements have been made with a well-known travel agency to staff it with two of their senior representatives every lunch hour until the needs of everyone have been satisfied. Inquirers can obtain full information regarding holiday haunts in this country and abroad, particulars of seaside and country accommodation, holiday camps, cruises and coach tours, advice on the best methods and costs of travel by land, sea and air, in addition to the other facilities usually available at the most up-to-date travel agencies. The service was opened on 18th January and attracted crowds of inquirers.

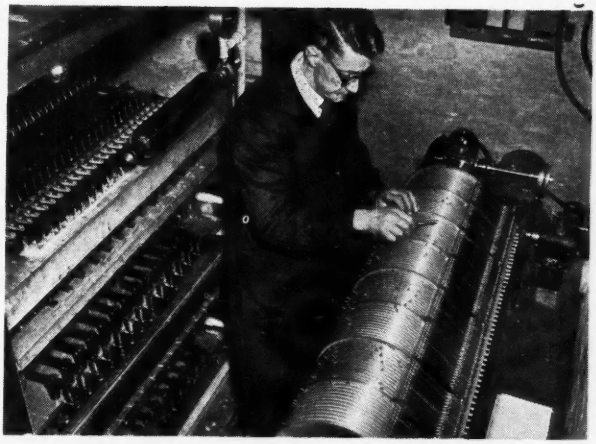
Cheaper Immersion Heaters

Although the recent reduction in purchase tax applies only to storage water heaters, British National Electrics, Ltd., have decided to reduce the prices of their entire range of immersion heaters and circulators by 10 per cent, so that the total retail price will be near to that which would have

applied had the tax on these products also been reduced. They have been enabled to do this by improved production methods.

Royal Exchange Carillon

The old hand-wound weight-driven carillon mechanism in the tower of the Royal Exchange in the City of London which has been out of commission since 1939 has now been replaced by electrically operated equipment. The new equipment was officially inaugurated on 20th January last by the Lord Mayor of London, Sir Frederick Rowland.



The electrical equipment of the Royal Exchange carillon

A more or less normal clock mechanism with a series of bells which are over a 100 years old is used to chime each hour, half-hour and quarter-hour. In addition, a motor-driven carillon can be used at will to play a series of tunes on the bells, of which there are thirteen altogether. The carillon is operated by a cylindrical drum or barrel which turns slowly through gearing from an electric motor of 1/30th h.p. The exact tune played is determined by a number of spikes or projections on the cylinder, very similar to those on the barrel in a musical box or barrel-organ.

As the barrel revolves, the projections close electrical contacts causing steel rods to move and hammers to strike the bells in the tower. Each hammer is at once returned to the striking position by means of a compressed air mechanism. The compressed air is supplied at 45 lb per sq in from a compressor driven by a 2½ h.p. motor. Sufficient projections are provided on a barrel to enable four different tunes to be played, but the repertoire can be extended in a few minutes by changing to another cylindrical drum.

Above the carillon mechanism in another chamber is the clock mechanism. This is gravity-driven by means of a falling weight which is wound up at intervals by an electric motor. Associated with the clock mechanism is a number of mercury switches and relays which provide for the compressor starting up to fill an air vessel, before another motor starts which drives the barrel.

The modernization of the carillon mechanism and the re-tuning of the bells has been carried out by Gillett & Johnston, Ltd., of Croydon.

Cromptonian Association

The annual dinner of the Cromptonian Association will be held on 9th June next at the Abercorn Rooms. Details will be sent to members at a later date. The hon. secretary would be pleased to hear from Old Cromptonians who are not members of the Association. He is particularly interested in hearing from Old Cromptonians now resident overseas. The address of the Association is Crompton House, Aldwych, London, W.C.2.

E.A.W. Conference

The Silver Jubilee Conference of the Electrical Association for Women will take place in Perth from 1st to 5th May. About 600 representatives from the Association's 102 branches will attend and will have the opportunity of studying some of the schemes for hydro-electrification in the Highlands.

The conference programme will include a paper on the social and industrial significance of hydro-electric power by Sir Edward MacColl, deputy chairman of the North of Scotland Hydro-Electric Board. Among those who will welcome the delegates to the Highlands will be the chairman of the North of Scotland Hydro-Electric Board, the Rt. Hon. Thomas Johnston, and the Lord Provost and Corporation of Perth, who will give a civic reception. A day will be spent in Edinburgh on the invitation of the chair-

man of the S.E. Scotland Electricity Board, Sir Norman Duke, and of the Lord Provost and Corporation.

New E.A.W. Examination

The Electrical Association for Women announces a new certificate examination for electrical sales assistants. The first examination will be held on 30th November next for men and women not less than seventeen years of age and who will have had at least one year's experience in a showroom or other commercial organisation. No domestic science qualifications will be required, as this examination is entirely separate from the existing E.A.W. electrical housecraft certificate examination.

Trade Announcements

The **British Thomson-Houston Co., Ltd.,** announces that its London district lighting section has been transferred from Watford to 44, Fitzroy Road, London, N.W.1 (telephone: Primrose 7181-5). Headquarters of the B.T.H. lighting advisory service remain at Bridle Path, Watford.

We are informed by **Metway Electrical Industries, Ltd.,** that they are now able to supply complete immersion element replacements for the "Hotric" immersion heaters.

Mr. E. M. Williams has taken over the South Wales representation of the companies of which **David Brown & Sons (Huddersfield), Ltd.,** is the head. He is attached to the group's Birmingham office, but works from his address at "Cremyll," High Cross Lane, Rogerstone, Mon.

From 1st February next the **Universal Electrical Co.,** 217-221, City Road, London, E.C.1, will be controlled and operated by U.E.C. (Rotary Converters), Ltd. It will continue to use its trading name of Universal Electrical Co.

As from 1st February next, **Benmotors Power Supplies** is taking over new premises and is abbreviating its trading title to Powerco (late Benmotors Power Supplies). The address will be Wandsworth Town Station, York Road, London, S.W.18 (telephone: Battersea 5234).

Management Institutes' Agreement

An agreement for co-operation on matters of common interest has been signed recently between the British Institute of Management and the Institute of Personnel Management. The independent status of the Institute of Personnel Management is unaffected by this agreement, and it will retain its separate identity and continue its professional activities. The British Institute of Management will encourage persons who wish to pursue a professional career in personnel management to join the I.P.M., and there will be a joint committee to deal with information and research questions in the personnel management field. The principal signatories were Sir Charles Renold, chairman of the British Institute of Management, and Miss Anne G. Shaw, president of the Institute of Personnel Management.

Switch Agreement

Cutler-Hammer, Inc., Milwaukee, U.S.A., announce the licensing of the British N.S.F. Co., Ltd., Keighley, Yorks, to manufacture their line of appliance, tool handle, automotive and aircraft switches for European distribution. This licensing arrangement was made through the Igranic Electric Co., Ltd., Bedford, for many years a Cutler-Hammer associate in the manufacture and sale of motor control and other heavy duty electrical apparatus. The licence agreement provides for the manufacture of C-H. switches by British N.S.F., to Cutler-Hammer specifications and under the general supervision of the Igranic Electric Co. Sales will be handled through the British N.S.F. distribution channels to the United Kingdom, Eire, the British Commonwealth (except Canada) and all other countries except U.S.A., South America, Mexico, Cuba and Egypt.

Catalogue and Lists

De Renzi, Holmes & Co., Ltd., Fox's Lane, Wolverhampton.—Two folders on cam-operated contactor controllers and contactor type crane protective panels for a.c. and d.c. motors.

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—Priced catalogue of fluorescent lighting fittings.

Signalarm Co., 53, West Street, Bristol, 2.—Priced folder describing the "Benney" burglar alarm system.

Geo. W. King, Ltd., Hartford Works, Hitchin, Herts.—Illustrated folder on the My Te Min electric chain pulley block.

Dewhurst & Partners, Ltd., Inverness Works, Hounslow, Middlesex.—Two leaflets describing pendant push button control units and direct-on-line hoist block controllers.

Arvin Electric, Ltd., Fernbrooke Avenue, Southend-on-Sea, Essex.—Priced folder on electric dry shavers.

J. G. Statter & Co., Ltd., 82, Victoria Street, London, S.W.1.—Catalogue (No. 555) on h.v. metalclad oil fuse switches, isolators and ring main equipments.

Dorman & Smith, Ltd., Ordsal Electrical Works, Manchester, 5.—Technical brochure on medium voltage air break switchgear type XLB of 25 MVA rupturing capacity.

ELECTRICITY SUPPLY

Orkney Windmill Generator
Canadian Water Power Plans

THE first large-scale windmill in Great Britain for the generation of electricity for public supply is being made by John Brown & Co., for the North of Scotland Hydro-Electric Board and will be erected on Costa Hill, Orkney. In Northern and Western Scotland, a considerable volume of power could be produced from the winds if economical and reliable machines were available, and this experimental windmill will serve as a first step towards solving the mechanical and aerodynamic problems involved. The tower, an artist's impression of which is reproduced on this page, will be built of steel and its foundations on solid rock. The sails will be each 30ft long. The nacelle, 78ft above ground, will contain a gear box and generator and will rotate to keep the rounded end facing the wind. The rated output will be 100 kW and it will be connected to the Hydro-Electric Board's network on the mainland of Orkney.

Artist's impression of the wind-driven generator which is to be built on Costa Hill, Orkney

Hertfordshire Breakdown

Through a fault on an overhead line between Knebworth and Welwyn there was an electricity failure lasting 40 minutes in a large area of South Hertfordshire on Sunday. The B.B.C. Brookmans Park transmitter, which is in the area, was affected and both the Home and Light programmes in the London area were interrupted.

Gold Coast Survey

The resources of the Volta River, Gold Coast, are being explored by a panel of five engineers of Sir William Halcrow & Partners, who recently left this country. The survey, which is being carried out at the request of the Gold Coast Government, is directed chiefly to ascertaining the possibilities of hydro-electric power at Ajena and Bui, irrigation, and the provision of port facilities.

Tenants to Choose

Tenants of future Council houses at Gateshead are to be allowed to decide which means of heating they prefer, gas or electricity. The chief architect (Mr. H. J. Cook) stated that electricity was cheaper, and several members of the Housing Committee have expressed themselves in favour of electricity. The Council is being recommended not to install wall panel electric fires in bedrooms in Council houses and the money saved in this way will be used to install improved cookers.

Houses Served by N.C.B.

Durham Rural District Council has been informed that the North Eastern Electricity Board cannot take over the supply of electricity to 200 pre-war houses at Bearpark. The houses are at present supplied by the National Coal Board.

Canadian Expansion

A continued rapid rise in commercial and domestic loads and in the demand for rural services is reported by Mr. Gibson, the Canadian Minister of Mines and Resources,

in a review of last year's progress in hydro-electric construction and distribution. Nearly 480,000 h.p. was added to the aggregate hydraulic capacity, which now amounts to 11,622,668 h.p., including plant installed in the new province of Newfoundland (272,050 h.p.). The increase last year was for the most part in extensions, no large new developments being brought into service. Plans approved for the future total more than 2,000,000 h.p.

British Columbia Development

The Aluminum Company of Canada has been granted a licence to develop the water resources of the Nechako and Nanika Rivers in the Tweedsmuir Park district of central and northern British Columbia. Major R. C. Farrow, Comptroller of Water Rights, has dismissed objections raised by fishery interests, who feared the effect on the salmon industry, and urged that the licence should be delayed until further studies could be made. Major Farrow points out that the Aluminum Company will in any event require another two years of survey and investigation before completing its own plans.

Loan for Installations

Batley Corporation has approved a scheme for the installation of electricity in 114 houses on the Nova estate. Application is to be made for sanction to borrow the sum of £2,920 in connection with the project.

Road Lighting

A new installation for Haltemprice U.D.C. of Metrovick "S.O.Fifty" lanterns covers 1½ miles of the main Class "A" thoroughfare into Hull from the south and west. The installation consists of 115 lanterns using 140 W sodium discharge lamps on 25ft narrow-based concrete columns with 2ft 3in side entry brackets, spaced at 130ft. Metropolitan-Vickers were the main contractors for the complete installation.

Overhead Lines in Peak Distric

At a meeting of Derbyshire County Council on 18th January the County Planning Committee reported that the electricity authority proposed to install high-voltage transmission lines and low-voltage feeder lines in the Vale of Edale, which is within the area of the proposed Peak District National Park. The committee said they appreciated that the cost of placing high-voltage lines underground would be great and they did not object to their being placed overhead. The installation of overhead lines to supply local properties would, however, seriously affect the amenities of the area and it was suggested that these should be placed underground.

Kendal Power Station Fire

Generating plant at Kendal power station was damaged by fire on 17th January and electricity supplies were cut off in Kendal, Staveley, Windermere, Bowness and Ambleside for periods of from 1¼ to 2½ hours.

Malayan Power Schemes

In an article published in the *Board of Trade Journal* for 21st January, the United Kingdom Trade Commissioner in Malaya deals with the Malayan market for United Kingdom goods, in the course of which he states that new electric power schemes in the Federation and Singapore will require equipment from the United Kingdom for an addition of up to 180,000 kW of plant to the existing supply capacity of about 100,000 kW. For Singapore especially the expansion of industry and housing awaits additions to the municipal electricity supply. There will be little scope until 1952 but there should then be a substantial increase in the demand for all kinds of industrial and domestic electrical goods. At present the market is saturated. Competition will be accentuated soon with the arrival of Japanese and German electrical goods.

Metrovick "S.O. Fifty" lanterns at Haltemprice, near Hull

PRISMATIC GLASSWARE

A New Lighting Demonstration Room

Entrance hall and stairway up to demonstration room

A DESIRE for artificial illumination, if it is to be suitable as well as adequate for the purpose for which it is intended, cannot be satisfied by the simple procedure of selecting a particular combination of lamp and fitting from an ordinary showroom display.

Accordingly, within the natural limitations imposed by the dimensions and proportions of the new demonstration room of Holophane, Ltd., there has been installed a comprehensive selection of fittings (plug-in mountings with relay switching) to facilitate the trial of alternative prismatic systems suitable for specific needs.

The old adage that "seeing is believing" is very apt in this case, for the room has been arranged to serve the dual purpose of illustrating the optical principles of light control and of indicating the wide range of application of glassware designed for the purpose.

In cabinets built into the wall is apparatus which demonstrates the accuracy of control afforded by typical examples of prismatic glass ware based on established physical laws governing the change of direction of a ray of light when it passes from one transmitting medium to another of different density.

This natural phenomenon can be employed to practical advantage because the extent to which the path of a ray of light may be deviated is predetermined by the profile of the glass enclosing the lamp and the angle at which the light is intercepted by the surface of the glass. This change of direction occurs in general both at entry and emergence from the glass and, by suitable design of the contours of both surfaces, a ray may be controlled vertically and laterally. This directional control of the light emission from the

Part view of the new demonstration theatre of Holophane, Ltd., showing wall cabinets on right and relay switching panel on left

lamp is a feature of all Holophane fittings which employ refracting, reflecting and diffusing prisms that are designed specifically to ensure the light distribution required.

In addition to the cabinets, ceiling equipment is arranged suitably in layout and types to demonstrate alternative systems, both with regard to their distribution characteristics and application to specific kinds of interiors. Each system embodies a group of four or six fittings of similar types mounted at appropriate heights and spacings in order that the performance of each lighting system may be appreciated under service conditions.

The wide range of fittings exhibited covers industrial reflectors of the metal covered and enclosed translucent types, flameproof, vapourproof and bulkhead units, floodlighting and streetlighting equipment, commercial pendants and in-built lighting units for most situations. Fluorescent systems are included and are mounted in such a manner that the relative merits of both surface and in-built systems may be readily assessed.

EAST AFRICAN TRADE

Expansion of Imports into Kenya and Uganda

IMPORTS into Kenya and Uganda of electrical machinery and appliances last year were valued at £1,290,000, of which the United Kingdom was responsible for £1,070,000, Canada £700 and the United States £23,000. The total was approximately twice that of 1947, although an exact comparison is prevented by changes in classification. Values of the main groups of electrical equipment imported with notes of increases on 1947, where possible, are given in the table below.

Kenya's ten-year development programme was last year hampered by shortage of labour generally and of technical personnel as well as materials, with the result that instead of the allotted £5,000,000 being taken up only about half that sum was spent. Much building work was undertaken, including schools, hospitals, police barracks and housing. According to the latest reports received in London by Barclays Bank (Dominion, Colonial and Overseas) there have been signs of overstocking by wholesalers, attributable partly to cautious indenting by up-country retailers.

Class of Goods	1948 £(000)	Inc. or dec. on 1947 £(000)
Generators, motors, convertors and transformers	165	+ 85
From United Kingdom	148	+ 73
„ South Africa	2	+ 2
„ Belgium	2	—
„ Netherlands	3	+ 3
Batteries and accumulators for motor vehicles	113	*
From United Kingdom	108	
„ Australia	2	
Lamp and torch batteries	35	*
From United Kingdom	5	
„ South Africa	28	
Other batteries and accumulators	6	*
From United Kingdom	4	
Bulbs and tubes for lighting, domestic	49	*
From United Kingdom	35	
„ Netherlands	14	
Ditto for torches and handlamps	7	*
From United Kingdom	3	
„ Hong Kong	3	
Radio receiving sets, domestic	150	+ 87
From United Kingdom	109	+ 55
„ Netherlands	33	+ 27
Ditto, other, and spares	35	+ 15
From United Kingdom	28	+ 13
„ Netherlands	4	+ 1
Telegraph and telephone instruments and apparatus	90	+ 36
From United Kingdom	89	+ 28
„ Netherlands	1	+ 1
Insulated cables and wire	224	+ 84
From United Kingdom	193	+174
„ South Africa	23	+ 9
„ Belgium	5	— 1
Portable tools and appliances and small household elec. devices not exceeding 15 kg.	41	*
From United Kingdom	40	*
Elec. appliances for motor vehicles, cycles and i.c. engines	29	*
From United Kingdom	18	
„ Australia	3	
„ United States	6	
Torches, complete or exclu. batteries and bulbs	45	*
From United Kingdom	11	
„ Hong Kong	33	
Other appliances and apparatus	166	*
Parts and accessories, unspecified	129	*
Elec. lighting fixtures	173	+100
From United Kingdom	166	+101
„ South Africa	3	+ 3

* Comparison prevented by changes in classification.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

The General Cable Manufacturing Co., Ltd.—The adjourned annual meeting was held on 20th January, when Mr. C. W. R. Pantlin (chairman) said that the sales turnover for the year was nearly 10 per cent higher than that for 1948, but the net profit figure was down by £4,000. The reduced margin of profit was due to the increased cost of raw materials which was not compensated for by an adequate advance to the consumer. On the contrary, on balance the selling prices were lower than in the previous year. In the circumstances the trading results for the year under review were not unsatisfactory, and unless there were further shocks ahead for the industry, it would appear that the high level at which business had been maintained since the end of that period promised well for the current year. Referring to the Commission on Monopolies and Restrictive Practices, Mr. Pantlin said that the cable industry was included in its terms of reference. He could see no justification for this, and in any event the independent cable makers had nothing to fear from any investigation.

The English Electric Co., Ltd.—The prospectus was published on 19th January and lists opened on Tuesday last for the offer for sale by Lazard Brothers & Co. of £3,000,000 4 per cent debenture stock, 1965-85, at a price of £99 per cent. The issue will provide £2,881,300 net. A further £1,000,000 is to be raised by a "rights" offer of 589,789 ordinary £1 shares at 35s. The proceeds are to be applied in reduction of unsecured bank overdrafts amounting to £5,096,417 at end of 1949.

The Rangoon Electric Tramways & Supply Co., Ltd., reports an income for 1948 of £71,220, as compared with £65,597 for 1947, and a profit of £18,397 (against £8,101). After deducting the preference dividend for the year to 31st December, 1943, and the half-year to 31st December, 1942, a balance of £28,739 is carried forward (against £25,342 brought in).

NEW COMPANIES

Smith Bros. (Woodhouse), Ltd.—Registered 18th January. Capital £100. General and electrical engineers, etc. Directors: W. M. Harrison and H. Smith. Solicitors: Henry Vickers Son & Brown, Sheffield.

Denis Allsopp & Co., Ltd.—Registered 13th January. Capital £100. Electrical engineers and contractors, etc. Directors: D. Allsopp and W. B. Moore. Regd. office. 95a, Villa Road, Handsworth, Birmingham.

Metro Radio Co. (Willesden), Ltd.—Registered 18th January. Capital £4,000. To acquire the business of Metro Radio Co. (Willesden), carried on by E. S. Hart at Willesden Green. Directors: E. S. Hart, P. H. Drake and Phyllis C. D. Drake. Regd. office: 87-9, High Road, Willesden Green, N.W.10.

Telefusion (Ilkeston), Ltd.—Registered 17th January. Capital £500. Directors: J. C. Wilkinson and Constance M. Wilkinson. Regd. office: 11, Nicholas Street, Burnley.

LIQUIDATIONS

Booth, Settle & Co., Ltd., electrical engineers, 15, Mawdsley Street, Bolton, Lancs. —A meeting of creditors was held recently when a statement of affairs was presented which showed liabilities amounting to £11,670. The net assets were £1,651, leaving a deficiency of £10,018 so far as the creditors were concerned. The issued capital of the company amounted to £1,740 and as regarded the shareholders there was a total deficiency of £11,758. A resolution was passed confirming the voluntary liquidation of the company with Mr. A. T. Eaves, of Harry L. Price & Co., 47, Mosley Street, Manchester, 2, as liquidator, together with a committee of inspection.

Llangollen & District Electric Light & Power Co., Ltd. — Members' voluntary liquidation. Meeting 20th February at 25, Bridge Street, Llangollen, to receive an account of the winding-up by the liquidator, Mr. N. Johnson.

BANKRUPTCIES

O. C. Walden, formerly carrying on business at Hinckley Road, Leicester, under the style of Hall & Frith, radio and electrical dealers.—Public examination 10th February at The Castle, Leicester.

J. T. Southwood, lately carrying on business at Belgrave Garage, Mutley, Plymouth, electrical engineer. — Order made 22nd December, granting bankrupt's discharge as from 5th January, 1950.

STOCKS and SHARES

THE seeker after a quiet life could find all that he wanted if he were to enter the Stock Exchange at the present time. Over the markets there hangs a curious atmosphere of lethargy, though business occurs, every now and then, in unexpected quarters. For instance, bonds in the Foreign Government market—German and Japanese amongst them—have recently been active. Money in plenty awaits investment, as the deposit accounts at the banks testify. The tendency of prices as a whole continues to be dull. But an issue such as that of the English Electric Company, offering attraction from the point of view of security and reasonable interest, secures a substantial amount of popular support. Prices in the industrial groups as a whole are easier; declines in most cases are trifling. International Telephone and Telegraph shares have taken a further jump to 25, which goes against 18½ a month ago, and Tokyo Electric "sixes" have gained 10 points over the past few weeks. British Government stocks advanced appreciably on announcement of favourable figures of national savings.

English Electric Debenture

The application lists for the new 4 per cent debenture stock at 100 opened and closed on Tuesday in this week. There was a rush for the issue and it is expected that, when dealings commence, the scrip will command a premium of at any rate 2 per cent. As a test of the rate of interest at which capital is currently prepared to lend to a first-class industrial borrower, this English Electric issue is an event of the first importance. The information in the prospectus impressively underlined the solid security for the stock in terms of assets and profits, as well as the company's trading position.

Prospectus Figures

The new English Electric 4 per cent debenture (redeemable 1965-85) is shown to be covered, in conjunction with the existing debentures, nearly four times by the group's net assets, and the combined dividends over nine times by average profits, just under £1½ million for the past ten years. Moreover, the company is satisfied that profits for 1949 will work out at not less than £1.7 million, which compares with £1.3 million for 1948. These figures interest the ordinary shareholders, who are shortly to be offered new shares at 35s on one-for-six basis. Their 10 per cent dividend is already covered by earnings of 27 per cent on the 1948 figure. English Electric £1 ordinary shares reflect the dullness which generally accompanies, these days, the prospective digestion of a new issue. At a price of 41s 6d, a fall of 2s on the week, the yield on the old shares is £4 16s 6d per cent, and rights to the new are worth about 1s per share held.

Equipment and Manufacturing

Electrical equipment shares, it will be noticed, lean to the dull side. Lines of stock are apt to take longer than usual in finding a home; most of the leaders are comparatively easy to buy in large numbers. General Electrics, on offer now at 73s, are on a 4¾ per cent yield basis. Crompton Parkinson new 5s "A" shares (resulting from the capital bonus) are available at 11s 7½d, and can be bought, free of transfer stamp, in the form of renounced allotment letters, until 10th February. The yield is £4 16s 9d per cent. Allen Wests at 7s pay just under 4½ per cent.

Falls and Rises

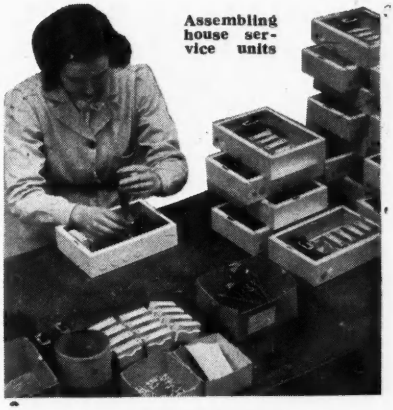
The majority of price changes since a week ago are towards lower levels. Murex 43s 9d, are down 1/6; falls of 6d to 1s have occurred in De la Rue, 22s 6d, General Electric, 72s 6d, Henleys, 21s 6d, Lucas, 25s 6d, Vactric, 10s. Westinghouse Brake at 60s 6d have lost a florin. On the other hand, Tube Investments, 5¾, Switchgear, 15s, and Oriental Telephone, 46s 3d, are 1/6 higher on the week, and Aberdare Cables at 2⅜ are 2s 6d to the good. Cable and Wireless ordinary regained 3 of its 4 points loss of last week, at 257½. British Electric Traction deferred is 20 lower at 450. Rises of 6d each made British Vacuum Cleaner 8s and Burco £1.

International Combustion Capital

A slight reaction in the price of International Combustion (Holdings) 5s ordinary shares followed the news that some 900,000 of the existing shares have been placed with financial institutions, the intention being to make a proportion available to the public through the Stock Exchange. The present price for the latter is 16s 6d per share. Awareness of a large potential supply of shares must be expected to subdue the market for the time being; later on, the effect of the deal in creating a freer market for the issue will be an advantage. Assuming that the 37½ per cent dividend will be adjusted to 15 per cent in conformity with the three for two capital bonus, the yield, at 16s 6d, is £4 11s 0d per cent.

Domestic Appliance Factory

Lytham Company's Expansion



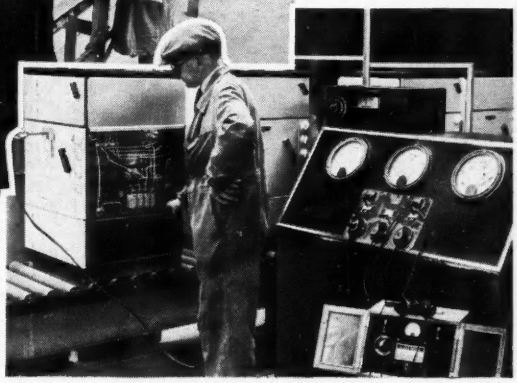
Assembling house service units

WHEN at the end of the war its work concluded as sub-contractors to Vickers aircraft factory at Squires Gate, Blackpool, Clifton Aircraft, Ltd., turned its attentions to the manufacture of domestic electrical appliances, commencing with irons (standard and streamlined non-automatic types) and fires. The original factory in Victoria Road, Lytham, rapidly became too small and new premises with three times the floor area were erected close by in Westcliffe.

We had an opportunity a few weeks ago to visit this factory and see how the increased accommodation has enabled the company to extend its range of products to include breakfast, table and standard cookers; boiling tables; house service, cooker and water control units.

To secure the maximum output, flow production methods employing roller conveyor systems for the larger items have been largely adopted. Well-equipped press shop, tool room and paint-spraying sections have been provided and comprehensive testing equipment is available. Though not fully occupied yet, the factory is designed ultimately to provide employment for approximately 600. A considerable export business has been built up and as much as half the total production of the factory has been going abroad.

Flow production methods employing roller conveyor systems have been largely adopted. Above: table cooker assembly



Comprehensive testing equipment is available. In the photograph on the right standard cookers are shown under test

NEXT WEEK'S EVENTS

Monday, 30th January

BOURNEMOUTH. — Wedgwood Restaurant, Albert Road, 8.15 p.m. A.S.E.E. Bournemouth Branch. "Stage Lighting," by L. Darke.

SHEFFIELD.—At the Sheffield Metallurgical Club, 198, West Street, 7.30 p.m. Junior Institution of Engineers, Sheffield and District Section. "The Fundamental Application of Electric Drives and Control Gear with special reference to Steel Works Practice," by R. Mathieson.

Tuesday, 31st January

LONDON.—Savoy Place, London, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Metering of Welding Loads," to be opened by G. F. Shotter.

Savoy Hotel, W.C.2, 6.30 for 7 p.m. Electrical Contractors' Association. Annual dinner.

At the Society of Tropical Medicine & Hygiene, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "Continuous Gauging of Materials in Thread or Wire Form," by J .C. Evans, M. Groneek and H. G. Loe.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "Fault-Throwing Tests on the 132kV Grid System under Normal Working Conditions," by W. Casson and F. H. Birch.

WALSALL.—E.P.E.A. Midland Technical Group, 7 p.m. "Modern Street Lighting," by P. Hartill.

Wednesday, 1st February

LIVERPOOL.—Accountants' Hall, Derby Square, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "The Measurement of Small Currents," by D. R. Hardy.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. "Blind Landing," by T. E. Schilizzi.

At the Royal Society of Arts, W.C.2, 6.45 p.m. Institution of Works Managers. "The Relationship between the Foreman and the Works Manager." (Joint meeting with the Institute of Industrial Supervisors.)

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, 6.30 p.m. I.E.E. Tees-side Sub-Centre. Informal discussion.

NEWCASTLE-ON-TYNE.—Minor Durant Hall, Oxford Street, 6.15 p.m. I.E.S. Newcastle Centre. "Railway Lighting," by G. W. Golds.

PALMERS GREEN.—St. John's Hall, Hopper Road, 8.15 p.m. A.S.E.E. North London Branch. "The Control and Protection of Electric Furnaces," by W. R. Brew.

PORTSMOUTH.—British Electricity House, 111, High Street, 6.30 p.m. I.E.E. Southern Centre. "The Design, Specification and Performance of High-Voltage Surge Diverters," by H. F. Jones and C. J. O. Garrard.

Thursday, 2nd February

CROYDON.—Café Royal, North End, 8 p.m. A.S.E.E. South London Branch. "Plastics," by H. E. J. Butler.

EXETER.—The Agricultural House, Queen Street, 7 p.m. I.E.S. Exeter Group. "American Lighting Trends," by A. L. Randall.

GLASGOW.—At the Institution of Engineers & Shipbuilders, 6.45 p.m. British Institution of Radio Engineers, Scottish Section. "The Performance and Stability of Permanent Magnets," by A. J. Tyrrell.

LONDON.—Savoy Place, London, W.C.2, 5.30 p.m. I.E.E. "Fault-Throwing Tests on the 132kV Grid System under Normal Working Conditions," by W. Casson and F. H. Birch. (Supply Section Paper.)

At the Royal Society of Arts, W.C.2, 6 p.m. Institution of Engineering Inspection. "A Survey of Present Methods of Industrial Statistics," by Dr. R. P. Dudding.

Friday, 3rd February

BIRMINGHAM.—Grand Hotel, 6.30 for 7 p.m. I.E.E. South Midland Centre. Annual dinner and visit of President.

BRISTOL.—Grand Hotel, 7 p.m. I.E.S. Bath & Bristol Centre. "American Lighting Trends," by A. L. Randall.

HUDDERSFIELD. — Electricity Showrooms, Market Street, 7.15 p.m. I.E.S. Huddersfield Group. "Visual Fatigue," by A. B. Nutt.

LIVERPOOL.—At the Liverpool Engineering Society, Dale Street, 6.30 p.m. A.S.E.E. Liverpool Branch. "Time and Motion Study," by R. Hunt.

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. Film evening. "Research in Engineering," introduced by Dr. J. M. Dodds.

NEWCASTLE-ON-TYNE.—King's College, 7 p.m. I.E.E. North Eastern Students' Section. "Electrical Technique Applied to Fuel Injection Equipment for Road Transport Vehicles," by R. C. T. Stead.

Saturday, 4th February

LEEDS.—Yorkshire Electricity Board Offices, Whitehall Road, 11 a.m. I.E.E. North Midland Students' Section. "Electronics in Industry," by G. Anton.

LONDON.—I.E.E. London Students' Section, 10 a.m. Visit to the London Hydraulic Power Co's., Grosvenor Road pumping station, S.W.1.

High Voltage Insulation

BEFORE a large and appreciative audience recently, Mr. F. C. Walmsley, of the Micanite & Insulators Co., Ltd., delivered a lecture on "Laminates Applied to High-Voltage Power Plant," to the Midland Section of the Plastics Institute, at the James Watt Memorial Institute, Birmingham. The application of insulation particularly to transformers and switchgear was examined and discussed, and a wide representation of plastics technicians and electrical engineers from the companies in the area subsequently adjourned to a reception during which an opportunity arose for a further exchange of experiences and a renewal of acquaintances.

CONTROL

for

A.C. MOTORS

Air Break,
Oil Immersed

Available for early despatch for Squirrel Cage and Slip Ring Motors.

OIL IMMERSED
ROTOR AND STATOR STARTER

VERITYS LTD., *Sales Headquarters:*
BRETTENHAM HOUSE, LANCASTER PLACE, W.C.2
Works: **ASTON, BIRMINGHAM 6**

MARTINDALE

Super Blowers

TWO MODELS:
1. "MILL TYPE"
2. "STANDARD"

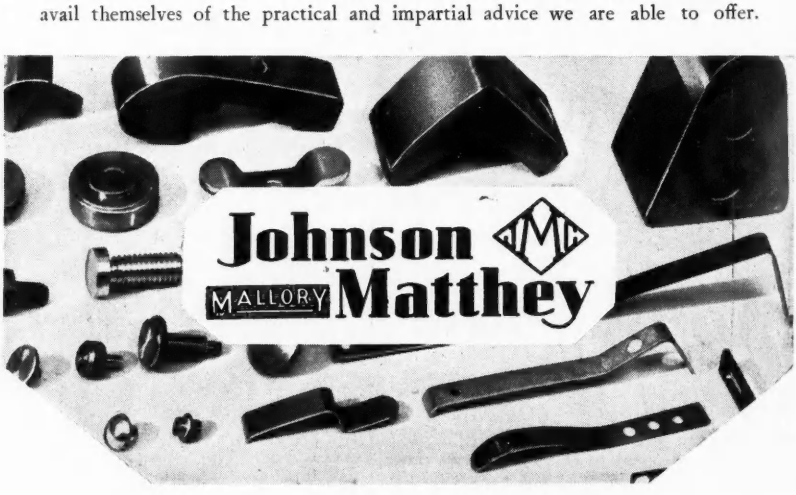
The most efficient, lightweight, portable blowers ever built. Martindale Super Blowers are precision built and fully balanced. Armatures and field coils are impregnated to withstand tropical climates under the most exacting conditions. Attachments available to convert to highly efficient exhauster for variety of purposes such as Export vacuum packing, suction cleaning etc. Guaranteed for 12 months. Write for details."

MARTINDALE ELECTRIC CO. LTD., 4, WESTMORLAND ROAD, LONDON, N.W.9.

Phone: Colindale 8642. *Grams: "Commstones, Hyde, London."*

CONTACTS MUST ACT EFFICIENTLY

The successful operation of innumerable types of electrical equipment depends upon contact efficiency. But to secure that efficiency many varying factors have to be taken into account. We are able to bring unrivalled resources and knowledge to the solution of all such problems, and the wide range of JMC and Mallory materials is the best possible assurance that a completely satisfactory selection can be made to meet the requirements of even the most difficult set of factors. Designers and engineers are invited to avail themselves of the practical and impartial advice we are able to offer.



JOHNSON, MATTHEY & CO., LIMITED
Controlling MALLORY METALLURGICAL PRODUCTS LTD.
HATTON GARDEN, LONDON, E.C.1
Birmingham : Vittoria Street, Birmingham 1

GD 111

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

21049. British Thomson-Houston Co., Ltd.—Apparatus for making electric-discharge devices. 1st December, 1944. (634291.)

1945

1230. Sperry Gyroscope Co., Inc.—Radio locating and/or indicating systems and apparatus therefor. 15th January, 1945. (634075.)

10142. Pelle, P.—Regenerating system for start-stop telegraphic signals. 23rd April, 1945. (634292.)

13870. Western Electric Co., Inc.—Radio location systems. 1st June, 1945. (634143.)

22123. Fairey Aviation Co., Ltd., Lisle, W. G., and Ebel, F. L. — Electro-hydraulic valve applicable to hydraulic systems. 20th June, 1946. (634293.)

22124. Fairey Aviation Co., Ltd., Ebel, F. L., and Lisle, W. G.—Electric control means for regulating the speed of two independently power-driven mechanisms. 19th July, 1946. (634294.)

28102. Telefonaktiebolaget L. M. Ericsson.—Arrangements for disconnecting false calls in automatic telephone systems. 24th October, 1945. (634076.)

28631. Stalder, F. — Electromagnetic riveting machines. 29th October, 1945. (634296.)

28773. Marconi Instruments, Ltd., and Brockelsby, C. F.—Apparatus for determining electrical properties of granular or other materials. 21st August, 1946. (634149.)

31070. Telefonaktiebolaget L. M. Ericsson.—Arrangement for selecting one of a number of similar circuits particularly in telephone systems. 19th November, 1945. (634151.)

31330. Lassus St. Genies, A. H. J. de.—Art of radiography. 21st November, 1945. (634152.)

1946

4848. Phœnix Telephone & Electric Works, Ltd., Hodder, H., and Smith, A. H.—Manufacture of commutators for dynamo-electric machines. 23rd March, 1949. (634078.)

4875. Compagnie Générale de Télégraphie sans Fil.—method of and means for the radio-electric detection of obstacles. 15th February, 1946. (634299.)

21034. Marconi's Wireless Telegraph Co., Ltd.—Television receiving apparatus. 13th July, 1946. (634306.)

23598. Compagnie Générale de Télégraphie sans Fil.—Magnetron circuit-arrangements for use as variable capacity reactance devices. 8th August, 1946. (634307.)

26920. Schlatter, H. A.—Transportable apparatus for the electric flash butt welding of heavy articles particularly railway rails. 6th September, 1946. (634308.)

27281. Colonial Radio Corporation.—Automatic tuning apparatus. 11th September, 1946. (634166.)

27510. Chadburns (Liverpool), Ltd., and Brewerton, N. E.—Electric telegraph and remote control systems. 12th September, 1947. (634093.)

27873. British Thomson-Houston Co., Ltd.—Electric selector switches. 17th September, 1946. (634094.)

28848. Broadway, L. F., Mayo, B. J., and Holman, H. E.—Electron guns. 27th September, 1947. (634310.)

30668. Hanert, J. M.—Electrical musical instrument. 15th October, 1946. (634168.)

31770. Speed Marketing Co. (Sussex), Ltd. Fuller, R. C., and Ruffle, W. H.—Fluid-pressure operated means for regulating or controlling the supply of electrical energy to electrically operated warning or other control devices. 3rd September, 1947. (634313.)

33006. Carba Akt.-Ges., and Eichmann, T.—Thermostatic diaphragm-actuated expansion valves for compression refrigerating apparatus. 6th November, 1946. (634100.)

34105. Grigsby-Allison Co., Inc.—Rotary electric switches. 18th November, 1946. (634171.)

1947

1818. Kennedy Van Saun Mfg. & Eng. Corporation.—Method of firing steam generators with pulverized coal more particularly pulverized anthracite coal and steam generator unit. 20th January, 1947. (634180.)

3991. Aktiebolaget Harnoverken, and Ramqvist, N. A.—Dynamo-electric machines. 11th February, 1947. Cognate application 3992. (634186.)

4346. Sylvania Electric Products, Inc.—Coating of metal filaments with electron-emissive materials. 14th February, 1947. (634187.)

5022. Black, D. H.—Pulsed-signal displays in radar systems. 3rd March, 1948. (634108.)

6669. Riley, E. G. B.—Light therapy apparatus and irradiating medium. 10th March, 1947. (634113.)

8063. Allmanna Svenska Elektriska Aktiebolaget. Means for producing low-frequency modulation of a higher-frequency current. 25th March, 1947. (634196.)

9412. Standard Telephones & Cables, Ltd.—Carrier current telephone systems. 9th April, 1947. (634199.)

10026. Marconi's Wireless Telegraph Co., Ltd., Peat, J. D., and Watson, D. W.—Aerial systems for omnidirectional radio range beacons. 18th December, 1947. (634201.)

10157. Fortiphone, Ltd., and Wolff, J.—Mounting and assembly of electrical circuits. 25th March, 1948. (634202.)

12764. Colonial Radio Corporation.—Image frequency suppressors. 12th May, 1947 (634205.)

12800. British Thomson-Houston Co., Ltd.—Tipping-off devices for electric lamps and the like. 12th May, 1947. (634119.)

12836. Carcano, E.—Electric plug-and-socket couplings. 13th May, 1947. (634218.)

20682. Automotive Products Co., Ltd., and Bradbury, F. J.—Power assisted remote control systems. 25th June, 1948. (634334.)

21233. Metals & Controls Corporation.—Thermally operable electric switches or circuit-breakers. 5th August, 1947. (634238.)

21842. Remington Rand, Inc.—Electric shaver motors. 8th August, 1947. (634335.)

21844. Remington Rand, Inc.—Electro-magnetic impulse motors. 8th August, 1947. (634336.)

21846. Remington Rand, Inc.—Methods of making electromagnetic impulse motors. 8th August, 1947. (634337.)

22926. Petty, J. D. Paxton-.—Electrical measuring instruments. 18th August, 1947. (634342.)

24939. Lucas, Ltd., J., and Winkley, A. W.—Electricity generating and storage systems for use on cycles or other like purposes. 2nd September, 1948. (634247.)

25161. Kolster-Brandes, Ltd., Wethey, E. P., and Babb, A. H.—Radio receiving apparatus. 10th September, 1948. (634343.)

26371. Electrolux, Ltd.—Absorption refrigerating apparatus. 30th September, 1947. (634349.)

26744. Ashley Accessories, Ltd., and Everitt, L. H. R.—Snap-action electric switches. 9th January, 1948. (634132.)

27723. Totalisators, Ltd. (Automatic Totalisators, Ltd.).—Relay unit for race totalizators. 6th July, 1948. (634133.)

28910. Marconi's Wireless Telegraph Co., Ltd., and Colchester, C. D.—Radio and like two channel signal transmission systems. 29th June, 1948. (634252.)

29402. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. — Detection of radiation energy. 4th November, 1947. (634134.)

30001. General Electric Co., Ltd., and Rowlands, R. O.—Electric filters. 26th October, 1948. (634257.)

30344. Teleflex Products, Ltd., and Pile, S.—Flexible cables. 14th December, 1948. (634259.)

30551. Bohus Mekaniska Verkstals Aktiebolag.—Heating apparatus utilizing steam produced by the passage of electric current through liquid. 18th November, 1947. (634260.)

30931. Standard Telephones & Cables, Ltd., Pheazey, J. R., and Deacon, H. J.—Machines for twisting electric conductors for use in electric cables. 19th November, 1948. (634261.)

31503. Crabtree & Co., Ltd., J. A., and Morgan, R. W.—Electric switches operated by a push bar or plunger. 22nd October, 1948. (634265.)

33937. Micofil Akt.-Ges. Werke fur Electro-Isolation und Wicklerei-Einrichtungen.—Slot insulation for the wound stators of electric motors. 23rd December, 1947. (634270.)

1948

285. Huebner, W. C.—Process and apparatus for electronograph printing. 5th January, 1948. (634278.)

401. Ames, B.—Control device for electric cookers. 6th January, 1948. 1st February, 1947. (634279.)

4306. Burgess Battery Co.—Deferred action primary electric battery. 13th February, 1948. (634281.)

4889. Allmanna Svenska Elektriska Aktiebolaget.—Means for simultaneously closing a plurality of electric circuits. 19th February, 1948. (634282.)

6409. Petrie & McNaught, Ltd., and Dawson, H.—Control systems for electric motors driving baling presses. 28th February, 1949. (634003.)

6415. Kooperativa Forbundet, Forening, U.P.A., and Brander, B. J.—Plug-and-socket connecting devices for electric razors. 1st March, 1948. (634004.)

6683. British Thomson-Houston Co., Ltd., and Thompson, J. T.—Electric control switches. 20th January, 1949. (634012.)

7071. Chloride Electrical Storage Co., Ltd., and Gray, R.—Electric accumulators. 1st March, 1949. (634025.)

7418. Duff, G.—Electrically heated means or appliance for preventing freezing of the water systems of internal-combustion engines and their radiators. 11th March, 1949. (634032.)

7526. Revo Electric Co., Ltd., Felton, A. E., and Price, F. H.—Rotary electric switches. 9th April, 1949. (634034.)

8329. Sharp, W.—Snap-action electric switches. 7th May, 1948. Addition to 580701. (634051.)

8340. Switchgear & Cowans, Ltd., and Legg, H.—Bayonet-type electric lampholders. 11th February, 1949. (634053.)

8391. Pirelli Soc. per Azoni.—Processes for the manufacture of insulated electric conductors. 22nd March, 1948. (634056.)

8514. Williams, H. M.—Devices for terminations of sheathed electric wires and cables. 23rd March, 1948. (634059.)

8942. Crabtree & Co., Ltd., J. A., and Morgan, R. W.—Shuttered electrical sockets. 27th January, 1949. (634066.)

1949

15482. Allmanna Svenska Elektriska Aktiebolaget, and Hedstrom, S. E.—Means for producing low-frequency modulation of a higher-frequency current. 25th March, 1947. Divided out of and addition to 634196. (634210.)

17102. Windsor Manufacturing Co., Ltd., and Collins, A. L.—Electric lamps more particularly for bicycle and other road vehicles 18th February, 1948. Divided out of 634392. (634288.)

Amended Specifications

517311. Stevens, A H. (Leland Stanford Junior University).—Methods of altering the velocity of flow of electrons.

594772. Standard Telephones & Cables, Ltd., and others.—Manufacture of electric condensers.

618941. Scholes & Co. Ltd., G. H., and another.—Electric plug-and-socket couplings.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 18th January.

BOFFIN. No. B681,155. Class 7. Electricity generators and electricity generating sets, and parts of all such goods included in Class 7.—Raylor Brothers, Ltd., Prince of Wales Building, 56, Lord Street, Southport, Lancs., and 81, Piccadilly, London, W.1.

RICCOLUX. No 681,964. Class 9. Electrical apparatus and instruments included in Class 9, and signalling apparatus and instruments, and parts of all such goods included in Class 9.—Guglielmo Riccomagno, Milan, Italy. Address for service c/o Marks & Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

STROBOLUX. No. 682,815. Class 9. Electrical apparatus and instruments included in Class 9; and scientific, wireless, photographic, optical, measuring and checking (supervision) apparatus and instruments; and parts of all such goods included in Class 9.—General Radio Co., Cambridge, Massachusetts, U.S.A. Address for service, c/o McKenna & Co., 12, Whitehall, London, S.W.1.

ECTRON. No. 678,187. Class 10. Electroconvulsant apparatus for therapeutic purposes.—R. J. Russell, Three Counties Hospital, Arlesey, Beds.

PICTOGRAPH. No. 669,047. Class 11. Electric lamps (other than photographic dark-room lamps) for photographic purposes.—Pictorial Machinery, Ltd., 37-39, Oxford Street, W.1.

KIROLITE.—No. 681,907. Class 11. Electric light fittings.—Kirolite Products, Ltd., 107, Southwick Road, Boscombe East, Bournemouth.

Swedish Import Relaxation

THE Swedish Government has announced that import licences are now issued automatically for imports from O.E.E.C. countries (other than Belgium, Switzerland and Western Germany, and their overseas territories) together with the rest of the sterling area countries. The full list of commodities is given in the *Board of Trade Journal* and includes the following:—

Electric motors and generators weighing more than 10 kg but not more than 3,000 kg; electric generators and motors, weighing more than 3,000 kg; transformers, reaction coils and converters; electric pumps; geared electric motors; stators, rotors, current collectors, magnet coils, brush holders and armature coils; incandescent lamps and discharge lamps; carbon filaments, even if metallized, metal filaments and lamp bases; carbon n.s.m. manufactured for electrotechnical purposes; insulated wire of non-precious metals; electricity conducting cables, lines and cords (sheathed with lead or other metals, not insulated with rubber or gutta percha); electronic tubes; electromedical and radiological apparatus; and electric locomotives.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Argentina.—BUENOS AIRES.—28th February. Directorate-General of Water and Electrical Power. Electrical equipment including two turbo-alternators for the Londres hydro-electric power station. (C.R.E. (I.B.) 30016/50. Ten/922.)* 28th March. Electrical and mechanical equipment, including two turbo-alternator sets for Pirquites hydro-electric power station. (C.R.E. (I.B.) 30048/50. Ten/924.)*

7th March. Directorate of Electricity and Mechanics, Ministry of Public Works. H.v. cables, other electrical equipment and spares. (C.R.E. (I.B.) 30675/50. Ten/909.)*

Australia.—BRISBANE.—31st March. City Council 11 kV metalclad switchgear. (C.R.E. (I.B.) 30010/50. Ten/891.)*

SYDNEY.—11th April. Metropolitan Water, Sewerage and Drainage Board. Electrically driven refrigeration plant. (C.R.E. (I.B.) 40009/50. Ten/923.)*

Bedfordshire.—County Education Committee. Electrical installation in Biggleswade Secondary Grammar-Technical School. (See 20th January issue.)

Belfast.—17th February. Electricity Department. Loud-speaking telephone installation. (See this issue.)*

Belgium.—BRUSSELS.—15th February. Regie des Telegraphes et des Telephones. Telephonic equipment. (C.R.E. (I.B.) 40960/50. Ten/928.)*

Birmingham.—14th February. City Estates Department. Electrical wiring in huts at Billesley Common Camp, Yardley Wood. (See 20th January issue.)

Blackpool.—15th February. Corporation. Supply of 25 sets of trucks, motors and electrical equipment and 25 single deck rail coach bodies for the Transport Department. (See 20th January issue.)

Chorley.—6th February. Corporation. Fittings and standards for electric street lighting. (See 20th January issue.)

Consett.—U.D.C. Installation of electric lighting in fifty-one houses. Plans by T. Hutton, surveyor, Council Offices.

Derbyshire.—18th February. County Council. Cables, conduit, lamps and electrical accessories for year ending 31st March, 1951. (See this issue.)

Droitwich.—10th February. Corporation. Installation of electricity in 218 Council houses. (See this issue.)

Egypt.—CAIRO.—18th February. Director General, Electricity and Gas Administration. Switchgear. (See this issue.)

Evesham. — 25th February. Corporation. Sodium discharge street lighting installation. (See 20th January issue.)

Great Yarmouth.—8th February. Corporation. Supply of electric cables for one year from 1st April next. (See 20th January issue.)

Hartlepool.—27th February. Corporation. Amplifying equipment at the Borough Hall. (See this issue.)

India. — BANGALORE. — 1st March. Mysore Stores Purchase Committee. One trolley-bus complete, 29 trolley-bus chassis, overhead line equipment, and rectifier substations. (C.R.E. (I.B.) 8279/49. Ten/902.)*

Ledbury.—21st February. U.D.C. Electrification of Massington pumping station and swimming baths purification plant. (See this issue.)

Leeds.—Regional Hospital Board, Heating and electrical contractors desirous of being included on approved panels for work to be carried out within the region should apply for application forms not later than 31st January. (See 20th January issue.)

Mitcham.—8th February. Borough Council. Supply of electric lamps for one year from 1st April next. Borough engineer, Town Hall.

Morocco.—TANGIER.—16th March. International Administration. One 950 kW and two 2,000 kW generator sets. (C.R.E. (I.B.) 40516/50. Ten/926.)*

Rothwell.—11th February. U.D.C. Sodium street lighting. (See this issue.)

Sandown - Shanklin.—18th February. U.D.C. Amplification equipment for concert pavilion. (See this issue.)

Sheffield.—3rd February. City Council. Installation of electrical services in 326 houses being erected on the Manor Park estate. W. G. Davies, city architect, Town Hall.

Skegness.—U.D.C. Provision of illuminations at the boating lake. (See 20th January issue.)

Stratford-upon-Avon. — Corporation street lighting, Winchester-Preston trunk road. (See this issue.)

Swanage.—10th February. U.D.C. Electrical installations in forty-six houses on Herston housing estate. (See this issue.)

Tettenhall.—11th February. U.D.C. Street lighting equipment. (See 20th January issue.)

Thailand.—BANGKOK.—20th February. Department of Public and Municipal Works. Two 600 b.h.p. diesel engines and alternators. (C.R.E. (I.B.) 40483/50. Ten/917.)*

Uruguay.—MONTEVIDEO.—14th April. Usinas Electricas y Telefonos del Estado. Transformer substations and transmission lines. (C.R.E. (I.B.) 30179/50. Ten/900.)*

* Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1. Victoria 9040.

Wembley.—8th February. Borough Council. Supply of electric lamps for one year from 1st April next. Town clerk, Town Hall.

West Hartlepool. — Education Committee. Electrical installation at the new Golden Flatts Junior School in Seaton Lane. S. M. Richmond, borough architect, Municipal Buildings.

West Riding.—3rd February. County Council. Partial re-wiring of, and additions to, the electrical installation at Northgate Lodge, Pontefract. County architect, County Hall, Wakefield.

ORDERS PLACED

London.—L.C.C. Electrical installation at Brackenbury Road School, W.10.—Powerlite Electrical Installations, Ltd.

Middlesex.—County Council. Recommended re-wiring fire station and flats at The Burroughs, Hendon (£693).—Johnson & Tanner.

Reading.—Corporation. Additional electrical apparatus at Manor Farm sewage disposal works (£2,180).—Crompton Parkinson.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Cardiff.—Large ice-cream depot, Fairlands; T. Wall & Sons, Ltd., The Friary, Acton, London, W.3.

Chester-le-Street.—Operating theatre, X-ray department and out-patients' department, Relton Hospital; secretary, Newcastle Regional Hospital Board, Newcastle-on-Tyne.

Crayford (Kent).—Houses (32) and 15 bungalows, Slades Green; U.D.C. surveyor, Town Hall.

Darlington.—Additions Salters Lane open-air school (£16,000); Bussey & Armstrong, builders, Brinkburn Road.

East Ham.—St. Stephen's infants' school (£69,913); H. A. Edwards, town clerk, Town Hall, E.6.

Gateshead.—Municipal centre near Shipley Art Gallery (£150,000); borough engineer.

Glendale.—Houses (40), Wooler, for R.D.C.; Reavell & Cahill, architects, Lloyds Bank Chambers, Alnwick.

Great Yarmouth.—Combined maternity and child welfare clinic, Middlegate Street; borough engineer, Town Hall.

Heald Green (Gatley).—Rayon research centre (£250,000) for the British Rayon Research Association; Lanchester & Lodge, architects, 10, Woburn Square, London, W.C.1.

Hornsey.—Houses (64) as first stage of development of Campsbourne area; J. H. Melville Richards, borough surveyor, Town Hall, Hornsey, N.8.

Hyde.—Pasteurizing and sterilizing dairy, Dukinfield Road; United Dairies, Ltd., 34, Palace Court, London, W.2.

Houses (36), Harbour Farm estate; borough engineer, Municipal Buildings, Greenfield Street.

Ipswich.—Houses (76), Castle Hill estate; borough surveyor, 19, Tower Street.

Jarrow.—Dairy, Leam Lane, for Craven Dairies, Ltd., Empress Street, South Shields; Mr. Anderson, architect, Denton Avenue, Newcastle-on-Tyne.

Kirkcudbrightshire.—Schools at Dalbeattie, Creetown, Castle-Douglas, Kirkcudbright, Dalry and New Abbey; county architect, County Offices, Kirkcudbright.

Llangennech.—Junior school; H. Thomas & Co., Ltd., Pottery Road, Sawmills, Llanelly.

London.—CATFORD.—Departmental stores, Rushey Green; British Home Stores, Ltd., 129, Marylebone Road, N.W.1.

POPLAR.—Maisonnettes (77), in eight-storey block, Teviot Street; borough engineer.

PECKHAM.—Four blocks of flats, Sumner estate extension, for the L.C.C.; Tersons, Ltd.; builders, 1, Seward Street, E.C.1.

Marple.—Houses (52), Willow Grove, for U.D.C.; Vessey Bros. (Contractors), Ltd., Canal Warehouse, St. Martin's Road.

Northumberland.—Schools at Bebside, Blyth (£120,000) (H. E. Pitt, Ltd., builders, Millfield, Sunderland); Longbenton (£334,000) (A. Anderson, Ltd., builders, Stanmore Road, Newcastle-on-Tyne); and Langley Avenue, Monkseaton (£130,000) (Hastie D. Burton, Ltd., builders, King Street, North Shields).

Conversion of Hexham Hydro into domestic science college for the C.C. (£43,000); G. Bainbridge, builder, 205, Westgate Road, Newcastle-on-Tyne.

Nottingham.—Factory, Bilborough; William Hollins & Co., Ltd., Viyella House, Castle Boulevard.

Paisley.—Houses (50), Hunterhall; town clerk, Municipal Buildings.

Rugby.—Grain silo for Ministry of Works; Lavender McMillan, Ltd., builders, 54, Cheam Common Road, Worcester Park, Surrey.

Salford.—Classroom blocks at Smith Street, Trafford Road and on site at corner of Clarendon Road and Westminster Avenue; Halliday & Agate, architects to E.C., 14, John Dalton Street, Manchester, 2.

Stoke-on-Trent.—Departmental store on site of Broad Street, Hanley; secretary, Burslem and District Co-operative Society.

Teignmouth.—Houses (44) for U.D.C.; surveyor, Bitton Park.

Towcester.—Houses (54); R.D.C. surveyor.

Upholland.—Houses (24), Highgate estate; U.D.C. surveyor.

West Bromwich.—Factory, Birmingham Road; Richard Berry & Son, Australian Works, Alma Street, Birmingham.

Wimbledon.—Adaptations at 117-123, Kingston Road, for workshops for Technical College (£45,441); Walker (Tooting), Ltd., builders.

Workington.—Extensions to office block at bus station for Cumberland Motor Services, Ltd.; Jonathan Saul, architect, National Provincial Bank Chambers, Workington.

Additions to Workington Infirmary (£170,000); Newcastle-on-Tyne Regional Hospital Board, 1, Lonsdale Street, Carlisle.

Worsley.—Houses (88) for U.D.C.; G. & J. Seddon, Little Hulton, nr. Bolton.